Practical Photography:

BEING

THE SCIENCE AND ART OF PHOTOGRAPHY, DEVELOPED FOR
AMATEURS AND BEGINNERS

ILLUSTRATED

BY O. E. WHEELER.

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CHAPTER I

INTRODUCTORY—WHAT IS PHOTOGRAPHY?—LIGHT AND ITS COMPOSITION—ACTINISM OR RAY FORCE—A SIMPLE EXPERIMENT—A SENSITIVE MATERIAL—WET COLLODION.

IN this and following chapters it is my intention to give in detail an instructive and, as far as is absolutely possible, an exhaustive account of practical photography in all its various branches. At the outset I must call attention to the title of this book. I have used the term "practical" advisedly. I disclaim all ideas of entering on any long historical preface, however interesting that might be. I am sure that all intelligent readers who study these "practical" instructions to their end will have at least sufficient enthusiasm to supply such ornamental *addenda* for themselves. Nor do I hold forth any hope of giving what is now-a-days the fashion to call "æsthetical commentary." To those who can really appreciate the beauties of so fascinating an art and study as photography, such superfluities will be unnecessary; to those who cannot, they are useless. After this curt and egotistical introduction, I shall at once enter into my subject, and proceed to give practical and straightforward instructions, by the careful observance of which an intelligent beginner may soon attain, not to mediocrity, but to excellence, which is the true goal and resting place of all the fair pursuits which we possess.

To begin, then, what is photography? Photography is the art of writing or producing pictures through the agency of light. The name is derived from two Greek words, the one signifying "light," the other "writing" or "engraving."

Simple as this definition may seem, it is useless without some explanation. This explanation is required by the word "light," which in this case is a general rather than an accurate term To show this I must commence by a short preface on "light" and its composition Light, as every one knows, is a powerful element in Nature, it is composed of rays of different colours, each of which performs a distinct individual function Thus the red or orange ray has a calorific or *heating* power, the yellow possesses an *illuminating* influence, while the *chemical* power, which is instrumental in producing light pictures lies in the blue or violet ray The thorough comprehension of these simple axioms is the key note to every branch of photography The profit arising from it will be perceived as the student penetrates deeper and deeper into the mysteries of the art For the present all that can be gathered is that the prime mover in the so-called art of photography does not exist in light generally, nor even in its illuminating power, but solely in its chemical influence, this chemical influence or property is technically known as "actinism," a term which is derived from a Greek word signifying a "ray," and which may be freely rendered into the English combination, ray-force

Photography (more correctly actinismography), then, is the art of producing a picture through the agency of light, or, better, through that of "ray force," which is the chemical or photographic element in light

From this theoretical preface I will proceed to find a material on which this "ray force" is to act, and so by the help of a camera and lens, and a convenient medium, such as glass or iron, to produce a photographic picture or image If an ordinary plate of glass is exposed to any actinic light, however strong, of course no change will take place The object, then, is to find a material which, when spread over the surface of the glass, will be susceptible to the actinic element in ordinary day light A simple experiment, if carefully performed (for nothing is more simple, and at the same time requires more care than photography) will give at once a suitable material, and will, moreover, furnish an excellent illustration of what I said above on the composition of light

Make a small box with a small hole in it, say about 2in square, besides this one hole there must be no aperture whatever capable of admitting light Next procure from any chemist a weak solution (in distilled water, otherwise a milky precipitate will at once be formed, which will detract from the distinctness of the experiment) of nitrate of silver, and a weaker solution of iodide of potassium Take the box and the two bottles into a darkened room, and by the light of a candle (for there is very little actinic power in a candle flame), pour the iodide of potassium solution into that of nitrate of silver, almost immediately a dense formation will take place This formation, chemically known as a precipitate, which is produced by the coalescence, in a certain degree, of a solution of iodide of potassium with one of nitrate of silver, partakes of the nature of both its components, and is hence called iodide of silver.

Put the bottle containing the precipitate into the box, and cover the aperture closely with a piece of orange or yellow glass, or even with silk or paper of those colours Sally forth from the darkened room, and place the box, with the bottle inside, in the sun After it has remained there for a few minutes take it back to the darkened room It will be found, if the glass or paper has not been moved, that no change whatever will have taken place in the colour of the precipitate Now remove from the aperture the covering which has thus been proved to be *non-actinic* (that is, impervious to ray force), and sally forth once more After a few seconds' exposure in the sun the precipitate will turn a rich brown, and if longer exposed to actinic light, will become almost black This result will establish three most important conclusions

(1) That there exists in light an actinic element which is capable of producing an impression on certain chemical substances,

(2) That if this actinic element is impeded by, or absorbed in, an orange or yellow medium, its photographic or chemical influence is rendered null and void,

(3) That amongst the chemical substances on which actinic force has power to act is iodide of silver Hence that iodide of silver is a susceptible or *sensitive* material

It will, however, be perceived that although an important stage in the rudimentary principles has been mastered, the sensitive material cannot be applied in this crude condition to the glass plate on which the image is to be impressed A careful preparation will have to be made, which, from the vessel in which it is contained when in use, is called the *sensitising bath* The principle on which it will be prepared has already been laid down the actual formula will be given in its proper place Again, granted even that the sensitising bath is already prepared, the plate cannot be sensitised without the aid of a substratum to cause the iodide of silver to adhere tenaciously to the plate The substratum used in the process which, while it is the first and simplest of all, is the one in almost universal use, is a fluid called *collodion* The glass plate is coated with the collodion, which is allowed to set but not to dry It is then immersed in the bath, in which it is sensitised and made ready for exposure in the camera

From this summary of the process it will easily be seen what part collodion plays in the preparation of the plate The ordinary process, to which I allude above, from the fact that the collodion is not allowed to dry before immersion in the sensitising bath, is called a "wet collodion" one, in contradistinction to the various "dry plate" processes, which will be fully discussed in future chapters For the present "wet collodion" will deservedly occupy the amateur's whole attention, and will amply repay all care bestowed upon it by affording a wonderful certainty of result and uniform facility of operation

To begin with its manufacture collodion is gun cotton (pyroxyline), dissolved in nearly equal parts of ether and alcohol In old manuals of photography elaborate instructions were given relating to the manufacture of collodion by amateurs, but the idea has of late been abandoned Now that the collodion of the market is an article of real excellence in the hands of makers such as Mawson, Thomas, Blanchard, Huggon, and many others, it is worse than useless for an amateur to lay himself open to all kinds of unpleasant contingencies in the manufacture of what, in his hands, will be an inferior article at a very extravagant price Let him buy his collodion at any well-known repository, and he will be on the safe side He should not, however, make his purchase even of the first few ounces without some knowledge of its qualities and appearance

The first lesson to be learnt is that photographic collodion has to be *iodised* before it is ready for use This gives it the pale amber colour which good collodion ought always to have The amateur can either iodise it himself or purchase it already mixed Perhaps the latter course, being more convenient and only involving the expenditure of a few extra pence in as many shillings, will recommend itself to the luxurious unprofessional If, however, he is resolved to be independent even in this small matter, he must bear in mind that collodion newly iodised never works half so well as that which has been mixed for some time

This is the last "practical" suggestion I shall offer my readers in Chapter I The way to coat the plate with collodion, which is the first little difficulty which has to be encountered, will be described later on.

CHAPTER II.

APPARATUS, WITH DESCRIPTIVE COMMENTARY—REQUISITE CHEMICALS AND FORMULÆ.

IN this chapter I shall give a descriptive list of the various apparatus required by the amateur in photography, together with some brief instructions as to the manner in which he should make his purchases before commencing actual practice. I have striven to make my remarks, especially those on the subject of purchase, acceptable to all classes of readers alike. Moderation is the golden mean between extravagance and parsimony. In photography the latter, as a rule, implies failure, while the former does by no means insure success. Taking moderation then as my general rule I shall endeavour to show how, by a moderate, but at the same time judicious expenditure, it is possible to procure a complete apparatus which will not only "do to learn upon," but will also in the hands of a proficient produce results to satisfy the most fastidious critic of the art.

In the first place, there are in photography certain fixed sizes, to the gauge of which almost all photographic apparatus is manufactured. The three principal of these sizes are: quarter plate, which is 4¼in. by 3¼in.; half-plate, which is 6½in. by 4¾in.; and whole-plate, which is 8½in. by 6½in. For these there are certain French symbols, which are as follow: Quarter-plate is represented by ¼, half-plate by ½, and whole-plate by 1/1. As reference to these sizes is constant in things photographic, it will be as well to inform the learner that a quarter-plate camera is one, the dark slide of which is constructed to hold a quarter plate glass, and a quarter-plate lens is one that will produce an image on a sensitive surface of quarter-plate size, and so on. Finally, it is to the gauge of quarter-plate that the following instructions on the head of apparatus will apply.

The first question to be dealt with is that of the *Camera*, or chamber, into which the light is transmitted by the lens, before impressing itself in the form of an image upon the plate inside. There are several kinds of camera, but they are all constructed on one of two principles, either wholly of wood with a "sliding body" for the purpose of focussing, or with an expanding concertina-like body of leather These latter, which from their lightness, are especially adapted for outdoor work, are called from their construction "bellows body" cameras In most cameras the expansion is effected simply with the hands, in others which are more finished, it is performed by a neat and handy screw adjustment This, however, is only necessary in cameras of very large size, and is hardly an advantage in taking pictures below whole plate A representation of an ordinary bellows body camera, complete with its slides and lens, will be found in Fig 1

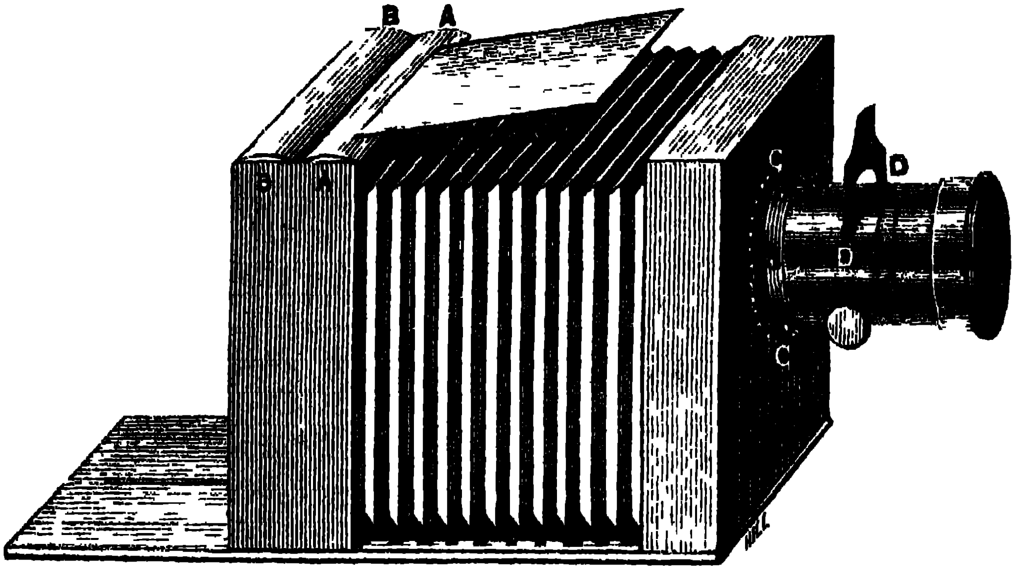

Fig 1 The Bellows Camera

The parts represented by A A and B B are occupied respectively by the dark slide and the focussing screen The latter is merely a sheet of finely ground glass, through which the operator scrutinises the object while adjusting the focus When in use, it occupies the space marked as holding the dark slide (A A), for it is of the utmost importance that the sensitised plate contained by the dark slide should be, during exposure, exactly the same distance from the lens as the focussing screen was during the adjustment of the focus Otherwise the foci would be different and the image on the sensitised plate would be as blurred and indistinct as it was on the screen before the focus was what photographers term "sharp" It must, moreover, be borne in mind, that the ground side of the focussing screen represents the sensitive surface of the plate, and must therefore be turned directly to face the object

The dark slide is shown separately in Fig 2 It possesses on one side a hinged lid, kept, when down, in its place by metal checks, to this is affixed a spring, which keeps the plate rigid during exposure, on the other it has a sliding shutter moving in grooves, also provided with a hinge and a piece of wood beneath it to prevent the shutter from sliding out altogether Inside the slide is placed a movable plate-carrier, with corners of silver wire After the preparation of the plate in the dark room the shutter is pushed down, the lid is opened, the sensitised plate is allowed to rest on the wire corners of the plate carrier, and the lid closed down to keep out the light, when the dark slide is in its place in the camera, the cap is placed on the lens and the hinged shutter is drawn up and allowed to lean forward, as in Fig 1 The cap is then removed, and after due exposure replaced, the shutter is pushed down, and the slide is borne off to the dark room to be developed Such is the construction and use of the dark slide The dark slide of an ordinary quarter plate camera usually contains two movable plate carriers, or, as they are sometimes called, inner frames, one to hold a plate of ¼ size, the other to hold a smaller one, 3½in by 2¼in (⅙) A new ¼ plate bellows body camera of polished mahogany costs at a good "repository" from 25s to 30s

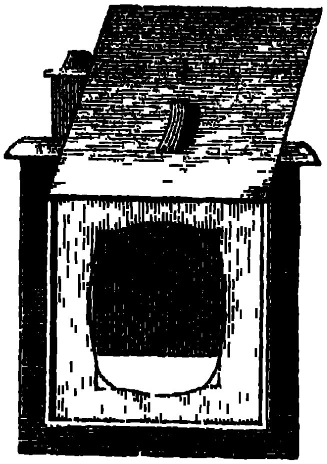
FIG. 2 THE DARK SLIDE

In front of the camera is fixed a brass flange (Fig 1, C C), into which is screwed the body of the lens The ordinary "combination" lens used for taking portraits consists of two compound achromatic lenses, mounted in a brass tube, with rack and pinion adjustment In most modern portrait combinations there is a simple and ingenious device by which the back lens can be taken out, and the front one, being reversed and screwed into the place left vacant by its companion, may be used for copying or taking views This is sometimes a great advantage, as it secures an image of the same size at about half the distance from the object required by a portrait combination In Fig 1, at the points D D, there is a slit cut in the tube containing the lenses, into which is inserted a piece of thin metal with a round hole in the centre These little perforated pieces of metal are most important items in photography, and from their inventor's name are called Waterhouse diaphragms or stops They are made with the centre holes of different sizes, and are employed to concentrate the rays of light in the course of their transmission through the lens They thus bring objects into focus which, without their assistance, would otherwise form a blurred and unsightly foreground, or would spoil the picture by making the background hazy and indistinct The chief thing to be remembered in their use is that the smaller the stop employed the sharper will be the picture, and the longer must be the exposure of the plate A good English quarter-plate lens, complete, with rack and pinion adjustment, and a set of Waterhouse diaphragms of different sizes, can be purchased for from thirty-five to fifty shillings Fair lenses, it is true, can be bought for much less, especially those of French manufacture, but it is as well to stipulate for "approval" before actual purchase in such cases The same remark applies to lenses procured promiscuously at low secondhand prices

After disposing of the two most important questions, viz, those of the camera and lens, I come to the tripod stand, which is used to support the camera when in use An ordinary ashen tripod with a solid round top may be purchased for a very few shillings, and will serve the beginner, for all practical purposes, quite as well as a more expensive one with movable legs, &c I shall take another opportunity for describing the very ingenious tripod lately invented and patented by Mr Kennett, as its price, which is 26s, will hardly bring it within the reach of a beginner

After this must be procured a focussing cloth of some dark stuff, which, if it be not within the limits of home resources, can be purchased of good quality for about half-a crown

The next indispensable is a number of glass plates of a size to suit the camera There are several kinds of glass employed by photographers, of which the best is "patent plate" A very good medium kind for beginners is "best polished sheet," of which a gross of plates of quarter size costs only 7s or 8s

The sensitising bath, with its case or stand and dipper, together with dishes, cups, bottles, rods, leathers, cloths, &c, &c, I shall, for the sake of convenience, consider as belonging to the "dark room and its appurtenances," a full description of which will form Chapter III

From these I must turn in anticipation to the process of printing from the negatives upon prepared sensitised paper For this will be required a few American pegs from which to suspend the paper while drying from immersion in the sensitising solution, also a pair of wooden forceps to keep the paper evenly immersed, and to remove it without using the fingers

In the actual process of printing, a few teak printing frames will be necessary Quarter-plate frames without glass fronts, may be bought for about a shilling a-piece

When their share in the printing is performed the negatives can be conveniently stored in white wood boxes made for the purpose, with grooved sides, to prevent the faces of the negatives from being scratched. These boxes, which are very cheap (one grooved to hold fifty negatives costing but 2s), are handy also to keep the clean glass plates in before sensitising

A set of scales and weights completes the list of apparatus, which may be enlarged, or, perhaps (but to no great extent), cut down to suit the taste and means of the beginner

I shall now proceed to give a list of the necessary chemicals, together with formulæ, for the various requisite solutions These last should be carefully preserved, as they are easily forgotten, and from any unforeseen accident may be required at any time I also advise my readers to copy out on an imposing card the table of Apothecaries' weight, and learn it thoroughly, signs and all This course will save them much trouble in their future photographic career, and much waste of valuable time will thereby be avoided

In laying in a stock of chemicals for his photographic laboratory, there is only one course open to the amateur, and that is to get every article of the very best quality that the market will produce There is seldom any difference between the price of good and bad chemicals, the difference lies in the places at which they are to be purchased On this subject a word in season may save trouble and expense Local chemists should for the most part be eschewed, unless they are known to be in a large way of business and to deal only in first-rate articles a small chemist seldom keeps the more essentially photographic chemicals in stock, and perhaps keeps you a week in utter helplessness for want of two or three indispensable grains The advice conveyed in this may, of course, be overruled in the case of common every-day chemicals, such as carbonate of soda and several others, but the more important and essential ones, such as recrystallised nitrate of silver, &c, should be procured either at one of the many excellent photographic repositories, or from some large manufacturing chemist in town

The following is a list of the chemicals employed in the ordinary wet collodion process, in the order in which they will be required, together with most of the formulæ for the proper composition of the various solutions

Collodion, and its nature, I have already explained (Chap I) I have, however, omitted one point in connection with it which deserves to be mentioned In producing pictures upon glass there are two distinct features One consists in simply obtaining an image on the glass without any view of further utilising it except for the sake of ornament, this, as the glass is reversed, presents when framed a *positive* picture to the eye, and is called the positive process In the second process the operator's aim is to procure a *negative* picture on the glass, which, by "printing," may be transferred positively to prepared paper Though the latter (since, from a good negative any number of photographs may be printed) is naturally the more attractive process, the amateur, as a rule, is supposed to confine himself for a short time to the taking of positives, in order to get accustomed to the various preliminary operations, which require some little practice In "positive" work a few of the requisite chemicals are different to those used in the negative process The first discrepancy arises in the collodion In former times the same collodion was equally applicable to both, but now that negative collodion is *bromo*-iodized to gain additional density, it is necessary to use for positives another and a special kind "Positive" collodion can be bought in any quantity at all the "shops" I would advise the amateur to begin by purchasing a small bottle of *positive* collodion, containing, perhaps, five fluid ounces, and two bottles of the same size of ready-prepared bromo-iodized *negative* collodion The first will serve him to waste in the mistakes of his apprenticeship, and the others with due care ought to last for some time An excellent all-round negative collodion is manufactured by Messrs Mawson and Swan, and can be bought anywhere for about sixpence per fluid ounce Many photographers prefer to mix it in equal quantities with that manufactured by some other well known maker, such as Thomas, but that is a point which lies entirely within the operator's discretion The collodion can either be kept in a corked or stoppered bottle, but care must be taken not to leave the bottle open for any length of time, as the ether is subject to rapid evaporation, and the liquid shortly attains the consistency of luke-warm glue The operator must also remember before pouring the collodion on to the plate to wipe off from the lip of the bottle all the refuse that from the evaporation of the ether has coagulated or set around it To obviate this last difficulty a handy stoppered bottle is sold, having a kind of second rim, which catches the refuse drops, and leaves the real mouth of the bottle quite clean and free from any coagulation

After the collodion I come to the Sensitising Bath, which is a question of very great importance The chief ingredient in its composition is, of course, *nitrate of silver* This should be bought "recrystallised," as it is in this state more fit for photographic uses than that ordinarily sold by local chemists The beginner should buy about three ounces of this somewhat expensive article, as it will be required frequently in future operations, such as renewing the bath, intensification, and sensitising the albumenised paper An ounce of *iodide of potassium*, and the same quantity of *nitrate of baryta*, should be purchased at the same time Of *glacial acetic acid* (solid at 50°) five fluid ounces had better be procured, as it is used also in the developer, and is sometimes handy to rescue the bath from alkalinity Finally, a large bottle of *distilled water* will be required, which it is best to buy at the shops Instead of distilled water boiled rain water can be used with success

In the sensitising bath, as well as in the collodion, there is some difference in the formulæ employed for positives and negatives This it is as well to lay a stress on, if the amateur is going to make the positives a special study, but if he only takes it up, say for a week, to get his hand in, it is hardly worth while to prepare a separate bath, which will have to be thrown aside and prepared anew when negatives are to be attempted, especially when the negative bath, if properly manipulated, produces quite as good a picture as is required to show the beginner "how it is done," and to make him anxious for higher flights However, to please everyone, I give the following formula (the best I know of) for the

POSITIVE SENSITISING BATH.

Recrystallised nitrate of silver	½oz.
Distilled water	8oz.
Positive collodion	1 drop

Shake well and filter, add two drops of nitric acid, and the bath is ready.

The sensitising bath is kept, when in use, in a porcelain vessel specially made for the purpose When not in use it may be kept in a stoppered bottle A quarter plate bath contains generally about 8oz of the sensitising solution, which should be carefully made up according to the above proportions

The formula for the negative bath is somewhat more comprehensive, and is as follows

NEGATIVE SENSITISING BATH

Sol I	Recrystallised nitrate of silver	1oz
	Distilled water	2oz
Sol II	Iodide of potassium	1gr
	Distilled water	1oz.

Mix the two solutions, and shake until the iodide precipitate disappears, then add a solution of 2grs. of nitrate of baryta in 9oz. of distilled water, and filter carefully

When the plate has left the sensitising bath an important stage of the proceedings is completed The plate is then exposed in the camera, and after exposure is brought back to the dark room Apparently it has undergone no change whatever, but a very great and mysterious change indeed has in reality been effected The plate, through the action of light, has been impressed with an image which for the present is a *latent* one This latent image requires to be developed, an operation which, in the case of *positives*, is effected by the following solution

POSITIVE DEVELOPER

Proto-sulphate of iron ...	100gr
Glacial acetic acid	⅓oz.
Spirits of wine	⅛oz.
Nitric acid .	4 drops
Water .	10oz.

In the case of *negatives* by

NEGATIVE DEVELOPER

Proto-sulphate of iron ,	¼oz
Glacial acetic acid	¼oz.
Spirits of wine	⅛oz
Water	8oz.

For the developing solution, as it is in constant requirement, about ¼lb of sulphate of iron, together with 5oz or 6oz of spirits of wine, should be procured In time the developer becomes quite brown, assuming the colour of brandy, but this, if the developer is made up in moderately small quantities, effects no deterioration of the slightest consequence

With the application of the developer, if the exposure has been correct, the image gradually appears But it not unfrequently happens in *negatives* that the image after development is a weak one, lacking gradation and contrast, and exhibiting insufficient difference between light and shade This is open to be remedied by a process called intensification, for which a standard formula is—

INTENSIFYING SOLUTION.

Pyrogallic acid .	10gr.
Citric acid	25gr
Distilled water	5oz.

A portion of this is poured over the plate and allowed to drain back into the glass , it is then mixed with a few drops of a solution composed of

Nitrate of silver	20gr
Distilled water	2oz.

The amateur should buy English pyrogallic acid, as that manufactured in France is of inferior quality

After intensification comes what is virtually the last operation, and that is to *fix* the image so as to render it unassailable by the further action of light This is done by either of the two following

FIXING SOLUTIONS

	I. Hyposulphite of soda	4oz.
	Water	5oz.
Or		
	II. Cyanide of potassium	¼oz.
	Water	10oz

I myself prefer the latter, but it should be used with the greatest caution, it contains a large proportion of cyanogen (the chief component of prussic acid), and is a most deadly poison In positives it should be used in preference to "hypo," but in negatives the amateur may take his choice

After fixing, the positive should be varnished to prevent its being scratched The negative should undergo the same operation if it is a good one, and likely to be called on to furnish a large number of prints Spirit varnish, as adapted to photography, can be purchased anywhere at a small cost Five ounces will last for a very long time, as the surplus can always be poured back into the bottle like collodion

The above will be all that is necessary to take a good positive or negative When this is done all anxiety is over The paper printing in the negative process, though in itself important, is quite a secondary matter In fact, it is by far the best course for the amateur to send his *good* negatives to a professional printer, who will produce prints far better and cheaper than the unprofessional beginner Nevertheless, I should by all means advise the latter to familiarise himself with the details of the process, and to this end will give a list of the few chemicals, &c, he will require The formulæ I shall reserve for a further chapter, which will be entirely devoted to the art of producing prints on paper from negatives of all kinds

Naturally, the first question in paper printing is the paper This is to be bought ready *albumenised* or coated with *albumen*, the most general form of which is the white of an egg A quire of albumenised paper should be procured, and care should be taken to get it of good quality To sensitise it, nitrate of silver will be needed, together with an ounce of *kaolin* In toning the prints the chief agent is *chloride of gold* This is bought in little tubes containing 15grs An ounce of *acetate of soda* and the same quantity of *carbonate of soda* will be requisite To fix the print, *hyposulphite of soda* is used The last necessary will be a small cake of Indian ink, to touch up any spots in the finished print

Now that the apparatus and chemicals are disposed of, there only remains one more "rudiment," and that is the equipment of the dark room, which will form the subject of my next chapter

* * *

CHAPTER III

THE DARK ROOM AND ITS APPURTENANCES

WHAT the library is to the student or the laboratory to the chemist the dark room is to the photographer In it his operations are begun and ended, it is his workshop and storeroom in one For this reason any imperfection in its construction or equipment may lay its possessor open to an almost endless train of difficulties and vexatious failures while, on the other hand, a little preliminary care and judgment will insure a degree of comfort and success which any future additions or alterations will seldom bring

To define a dark room technically, it may be said to be a chamber free from the ingress of actinic light, where certain operations in which actinic light ceases to be a useful agent and begins to exercise a destructive influence, may safely be performed It will be necessary before selecting or constructing a dark room, and especially before furnishing it with suitable appurtenances, to enumerate what, in the ordinary wet collodion process, these "dark" operations will be They are performed in the following order (1) Sensitising the plate, and transferring it from the sensitising bath to the dark slide, (2) Development, (3) Intensification And in the process of paper printing (1) Storing the prints before trimming and toning, (2) Trimming, and toning them in the bath of chloride of gold Keeping these five "powers of darkness" in view, let us consider in what kind of chamber, and with what appurtenances they may successfully and conveniently be dealt with

Naturally its shape and position are the first points for deliberation These for an amateur must nearly always be matters of circumstance A professional would have his dark room specially constructed to adjoin his glass house or studio, but as the amateur's dark room is generally an ordinary chamber or outhouse adapted to a purpose for which it was not originally intended, and his glass house nothing more than a vision of the future, he must be content to waive the questions of shape and situation, and compensate for all exterior imperfections by extra attendance to interior comforts If, however, he is fortunate enough to be offered a choice, let him secure on the ground-floor (or, what is more reasonable, among the outhouses) an oblong room not less than 12ft long by 6ft broad I have purposely named a large size, because it is my opinion that a beginner, especially in a delicate art like photography, should be always allowed plenty of room It will be a long time before he can arrange his bottles and apparatus (to say nothing of his ideas) with anything like method, and by the time he has accomplished that, he will be seized with a frantic desire to attempt something new—dry-plate photography, the manufacture of emulsions, and the like All this will require extra space, and if the space is not ready to his hand the impatient tyro will be plunged into confusion and despair The photographer should remember also that compounds like collodion cannot fail to vitiate a too-confined atmosphere, and that a few square feet gained in compactness are poor substitutes for the loss of comfort and health My own photographic *sanctum* comprises two rooms, one opening into the other In the inner one, which is of considerable size, I collodionise and sensitise my plates, in the outer there is a tap and sink at which I develop, intensify, and fix By this method I keep my inner room almost entirely free from dust and impurities, and ready at all times for any experiments I may wish to make As a hint to brother-amateurs, I may remark that these two rooms were originally nothing more or less than the washhouse and ironing room of a laundry The scene of my first attempts was an unoccupied harness room, this, however, I was soon forced to leave, from the absence of a sufficient and convenient supply of water, and from the presence of a most unnecessary supply of dust Talking of dust, the first thing to be thought of after choosing a dark room is to render it as free as possible from this inveterate foe to photography Cobwebs and all such abominations must be carefully removed, and never allowed to appear again If the floor seems likely to give trouble, it should be covered with some smooth substance, such as ordinary oil cloth

And now I come to the *lighting* of the dark room This seems a rank Hibernicism, but careful readers will have discovered that darkness may certainly in this case be relieved by light, provided it be of a non-actinic kind Yellow and orange glass, cloth, or paper can easily be obtained, according to the taste of the purchaser The best place for the window in the ideal room I am describing is one of the ends, if the door opens into one of these ends, the window should be inserted by its side, about four feet from the floor This, as will soon be shown, allows an oblique light to be cast on the plate during development, a process in which a good light is required to judge when it is complete, or whether intensification will be necessary A square foot of ruby glass makes a perfect window, which will give ample light, and, if procured of proper quality, be completely impervious to actinic force This glass should be fixed in a sash, and the whole window should be made to open like the port-holes of a ship Thus, while the plate is being sensitised, the fumes of the collodion can be allowed to escape, the same course can be adopted while fixing, if that operation be performed with cyanide of potassium in preference to hyposulphite of soda If yellow or orange glass is not used, a good non-actinic light can be obtained by pasting two or three thicknesses of orange paper over panes of ordinary glass

An excellent suggestion concerning the light of the dark room is offered in the Almanac of the *British Journal of Photography* for 1878, by Mr Werge, the proprietor of the well-known photographic repository in Berners-street His plan is to place over the orange or yellow light of the window a piece of *green* glass, which, while neutralising the unpleasant ocular effect which yellow and orange possess, does not interfere with their non-actinic property Those who are eternally flitting in and out of their dark room, as amateurs invariably do, will soon perceive the value of this sound and practical suggestion

Failing a window of any kind, a lamp or a candle may be employed, but the light should be mitigated by a non-actinic shade, especially when the plates are extra-sensitive

The *furniture* of the dark room is a very simple matter It should consist simply of a strong deal table, running, if possible, the whole length of the wall Underneath should be a common cupboard, in which stock solutions, &c, may be kept The stock solution of the developer may be made up and kept in a Winchester or a Corbyn quart, and the collodion either as it is purchased, or in tall bottles with narrow necks, so as to allow all impurities to sink to the bottom, and to prevent evaporation while decanting into the smaller bottle employed in every-day practice Hyposulphite of soda and other crystals should be kept in saturated solutions, so as to be ready, by merely adding water, for immediate use Cyanide of potassium, for fear of accidents, whether in solution or otherwise, should always be kept in a distinguishable bottle and clearly labelled "Poison"

At the end of the table, directly under the window, there should be fixed a sink, at which, after exposure, the plate can be developed and washed A good plan is to have this made of porcelain, with a plug ground to fit the waste pipe. The sink can then be used for washing prints and other incidental operations, it will be especially useful, as will be seen, in dry-plate and Autotype work In the middle of it should be placed a small basin, which will serve a double purpose first, to rest the plate on during washing and to afford relief to the fingers; secondly, to serve as a receptacle for the residues of silver in the processes of development and intensification. These residues, together with odd slips of sensitised paper and other scraps contained silver or gold, can be disposed of to professed assayers, and a marked saving realised by the economical operator. Above the sink should be an ordinary, gently running tap. If water is not laid on, a jug can be employed, or what is better, a filter placed on a strong shelf a little over the sink. The waste can be led away to a tub or bucket, which, when full, can be carried off and replaced empty. Around the sink should stand the developing, intensifying, and fixing solutions, together with the measures into which the first two are respectively poured before they are flowed over the plate. For the developer a 1oz measure and a funnel of the same capacity will be required; for the intensifier, a smaller measure to contain, say, half a fluid ounce, will be necessary. If cyanide be used for fixing, it can be poured on from the bottle; if hyposulphite be preferred, the solution should be prepared and administered in a dish.

At the dark end of the table should stand the prominent feature of the operating room—the sensitising bath. This can be of glass, porcelain, or ebonite. It may rest in an oblique position, either on a stand or in a case with a cover to keep off the dust. A porcelain bath, with a lip, in a plain deal case, is perhaps as well fitted for a beginner's room as a more expensive air tight one in a polished and brass-bound case of mahogany.

The plate is let down into the bath by means of an instrument called a dipper. The best dippers are made of pure silver, but one of common glass, fluted to prevent capillary attraction, will, for all practical purposes, be amply sufficient. Near the bath should stand the collodion bottle, and one or two sheets of blotting paper on which to drain the sensitised plate before transferring it to the dark slide.

On the space between the bath and the sink may be placed the chemical chest, together with a few incidental necessaries in the way of apparatus, &c. Two or three porcelain dishes will be required in the process of paper-printing, also a few glass rods for stirring. Filtering papers *ad lib.*, with a small pestle and mortar and a spirit lamp are always being wanted. Dusters the operator must please himself about, but he must take care they are clean and always ready to his hand. He must remember also to procure a soft chamois leather and a camel's hair brush for cleaning the plates.

With these minor "appurtenances," which each person must regulate according to his taste and requirement, I will end the present chapter.

* * *

CHAPTER IV.

Commencement of Operations—Positives on Glass—Pouring on Collodion—The Plate Sensitised—The Final Focus—Exposure—Development—Fixing, &c

The object of the instructions which have preceded this commencement of operations has been to prepare my readers both mentally and materially for the results, to which it will henceforth be their object to attain These prefatory instructions are now complete, and the time has come to put their reliability to the test of actual practice, and suggestions relating to the purchase of apparatus or chemicals will now be succeeded by a detailed account of their use and of the results which they unite to procure

I have already explained (Chapter II) that photographic pictures are of two general kinds, positive and negative The former of these being, as I remarked at the same time, the one on which the beginner usually tries his "'prentice" hand, my first object shall be to teach him how to produce a positive picture This again may be accomplished in two ways: either with the help of a glass or a metal plate Positives on metal are called *ferrotypes*, and will receive special mention shortly For the present, I shall describe how to produce a positive image on a prepared plate of glass

Before attempting the operations, let the operator assure himself that he is thoroughly prepared to carry them out without intermediate delay Let his dark room be neat and as free from dust as possible, his bottles and apparatus methodically arranged and ready for use, and his solutions carefully made up and distributed in their respective vessels The slightest speck of dust must not appear on his lens or be allowed to hover in the inside of his camera In fine, every implement he is about to employ should be scrupulously clean and in its allotted place

The photographer's next care should be the object on which he is resolved to exercise his skill His, her, or its position is a matter of great importance, which will have a material effect on the finished picture The question of "pose," however, depends so much upon the appearance and firmness of the sitter, that I must leave it altogether to the operator's discretion and artistic taste Perhaps an occasional look through an album of high-class portraits, and a comparison between them and his own attempts in this line, may benefit the beginner far more than any general rules With regard to the "situation" of the object, if the performance is to be conducted in the open air, I can recommend no more useful "property" than a common garden seat, constructed of rough-hewn logs, which, from its unstudied appearance and freedom from artificiality, has always a pleasing effect The question of "lighting" is not so important in the positive as in the negative process, where the delicate paper-print is especially sensitive to effects of light and shade There is one mistake, however, that must particularly be avoided, and that is working with the sun in front of the lens, if not at the operator's back, it should be at his side, but never shining in his face Windy days should be eschewed, as a disturbed ribbon, or even lock of hair, may frequently spoil a picture

I will suppose now that the object is gracefully, appropriately, and conveniently posed, and that at as nearly a suitable distance as can be guessed, the camera and lens, resting on their tripod stand, are directed towards it It is now time to obtain the general focus Insert in the groove shortly to be occupied by the dark slide (which should have been left meanwhile in the dark room) the focusing screen, and throwing the focusing-cloth over your head and shoulders, scrutinise the object carefully through the ground-glass plate If necessary, move the camera and tripod backwards or forwards, as the case may be, until some sort of image is apparent To obviate the troublesome delay that this usually causes the beginner, it is a good plan to focus the seat carefully before the sitter is called upon to occupy it When the image is about the size required, complete the general focus by moving either the sliding or bellows body of the camera until the object is as distinct as possible This will do for the present, and, cautioning the sitter to make no material movement in the position you have determined upon, you can now retire to the dark room to prepare the plate

On reaching the dark room, you must take especial pains to clean the glass plate which you are about to use for the picture There are innumerable formulæ for plate-cleaning solutions, all more or less efficacious, which the amateur can adopt or not as he pleases For myself I find that first a thorough rinsing under the tap, and then a little alcohol or dry tripoli powder well rubbed on and off with a piece of chamois leather, or a clean handkerchief, will brighten the most obstinate plate, provided it be of good quality. After whisking off with a camel-hair brush any minute particles of dust that may have settled on the plate, it will be ready to be collodionised

A correspondent, an old amateur, sends me the following particulars of his plan of plate cleaning, which, he says, he has, in a lengthened experience, found to answer admirably —"Take, say, a dozen or any number of plates, and, after rinsing and washing them well in hot water, rubbing them the while with a piece of rag, place them for a few hours in a weak solution of hydro-chloric acid, I usually leave them in this a night This done, mix some whitening with water, to the consistency of Devonshire cream Take a plate out of the acid solution, just dip it in water to remove the acid, then, with the finger or soft brush, daub on the whitening, cover both sides of the plates and the edges with this material It should be laid on just thick enough to cover the glass, but too much is better than too little Now stand, or rather lean, the plate against a wall on a shelf or any other convenient place, out of the dust, to dry. All the plates are to be treated in the same way, and laid aside to dry When perfectly dry they may be put together and wrapped in paper, where they are left till wanted. When a plate is required for use, gently rub off the whitening with a clean soft rag, or a piece of soft paper will do Rub it off the edges the same way, being careful to touch the plate no more than is necessary with the fingers The whitening is removed in half a minute, and when this is done you have only to give the plate a little gentle polishing with a clean chamois leather, or a piece of cotton wool It will then be found that the plate has a beautifully clean and highly polished surface. If a sprinkling of the whitening be left on the plate, the gentle application of the chamois or cotton wool will remove it. The advantages of cleaning the plates thus may be summed up as follows Any number of plates can be cleaned and coated with the whitening days, weeks, or months before they are wanted for use, when wanted they can be made ready at a minute's notice, and when ready they are thoroughly clean. It is very advantageous, too, not to have to moisten the plates just before collodionising"

Pouring on the collodion is a difficulty which the beginner needs some little practice to overcome, and as such requires some explanation. Those who have never seen it properly performed will learn more readily from the accompanying illustration (Fig 3) than from any description, which from its prolixity would be confusing

Taking, then, the wood-cut as a reference, proceed as follows:—Hold the plate level by the corner (A) between the finger and thumb of the left hand; from the bottle in the right hand pour a stream of collodion which you judge to be of sufficient volume, when spread, to cover the plate with some small surplus Let the stream fall on the plate between the corners B and C, at a point inclined to the centre, E Tilt the plate slightly to allow the deposit to flow to B and C, to prevent its running over the edges, again tilt it, this time towards the hand which holds it, and let the collodion flow down in a steady stream to the corner (A), then, before it has time to touch the thumb, tilt the plate a third time and let the surplus run off from the corner D into the mouth of the bottle held to receive it in the right hand as before As the surplus collodion flows back into the bottle, rock the plate slightly to prevent the thin film which remains from setting in "crapy" lines upon the plate With a very little practice the whole of this operation can be performed with great dexterity, and without wasting a single drop of collodion, in a fraction of the time it takes to describe it

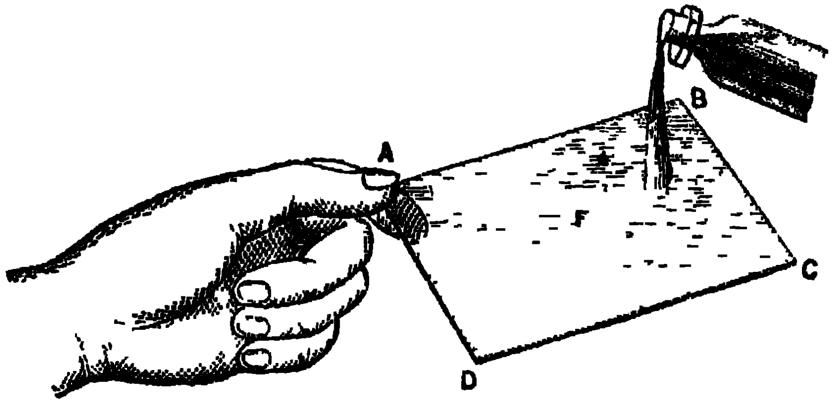

FIG. 3. POURING ON COLLODION.

If the collodion be poured from any but a "cometless" bottle, before pouring, the finger should be passed round the mouth to clear away the refuse which has, from the speedy evaporation of the ether, set round it either since the last pouring or during the decanting from the stock bottle to the one in everyday use

When the collodion is set (but not dry) in an even film all over the plate it is ready to be sensitised in the sensitising bath Holding the plate still by the corner between the finger and thumb of the left hand, remove with the right the cover from the case containing the bath and dipper Pull up the dipper and let the plate rest, collodion side upwards, upon the ledge at the bottom, then plunge the dipper with the plate resting upon it slowly and steadily to the bottom of the bath Be particularly careful not to hesitate for the tenth part of a second in the downward movement of the hand which lets down the plate into the bath. If you do, the plate will not be evenly sensitised, and a line will be seen across the plate at the point where the movement was stopped

When the end of the dipper safely rests on the bottom of the bath, put on the cover and rest from your exertions If you find the fumes of the collodion too powerful, open the window and take a good breath of fresh air When the plate has been in the bath about a minute, take off the cover and gently move the dipper a few times up and down This will cause a disturbance of the solution and prevent greasy lines from forming on the film Again put on the cover and prepare the dark slide for the reception of the sensitised plate If the slide is not specially made with a groove to allow the plate to drain, it is best to place small pads of blotting paper over the two lower silver wire corners of the plate carrier When this is done, and the plate has been in the bath from two to four minutes (according to the heat or coldness of the weather), lift up the dipper, and taking the plate by the corner at which it was held before, lift it off and allow it to drain on to a piece of blotting paper The dipper may be returned to the bath and the cover replaced to exclude all dust When the plate has been drained it should be transferred to the dark slide, the corners of the plate resting upon the corresponding corners of the plate-carrier The lid of the slide, which is fitted with a spring to keep the plate rigid and in its place, is now shut down, and the plate is ready for exposure

When the lid of the dark slide has been closed down and prevented from suddenly opening by the adjustment of two metal checks, the plate can be carried with impunity into the open light to await exposure in the camera. If, however, the sun be very powerful, the slide should be carried under the coat or wrapped up in the focusing cloth The operator should also take care not to allow the shutter to slip, and so to give entrance to a current of light

When the spot where the camera stands is reached, the slide should be set down, and the final focus secured If the sitter has made no material movement since the general focus was obtained, and the image is still distinct, this can be done by manipulating the rack and pinion adjustment of the lens until the image is perfectly defined and "sharp" in the part or parts which are to be reproduced If it is desired to obtain a full-length portrait or the reproduction of any object the distances of which, when viewed through the screen, are not equally "in focus," a diaphragm or "stop" should be inserted between the lenses, to concentrate the light and to render the foreground and background of an object as clear (in reasonable proportion) as the object itself If rapidity is required, and perfect definition is of no great consequence provided a good likeness of any particular portion be obtained, a diaphragm (or at least one with a very small perforation) need not be employed, as, while its use increases the definition, at the same time it adds to the necessary length of the exposure The "stop" can also be dispensed with in taking vignettes or head-and-shoulder pictures, but in full-lengths, groups, and landscapes, it will be found in the case of ordinary lenses, an invaluable addition

When the focusing is fairly settled, the focusing screen can be drawn out and set on one slide, and in the groove left vacant by it the dark slide inserted* Now, supposing the cap to be still on the lens, steadily draw up the shutter of the slide and allow it, when the hinge is reached, to lean forward towards the lenses If the light is strong, it is as well to perform this operation under cover of the focusing cloth, as the opened hinge frequently forms a chink by which the outer light can freely enter Caution the sitter to remain quite motionless (except as to his or her eyes, which should be blinked freely, otherwise a fixed and unpleasant stare will be the result) and remove the cap as quietly as possible from the lens

On the question of exposure I can give no fixed instructions Length of exposure varies as the light varies at six o'clock in the morning and six in the evening, in the murky fog of November and in the brilliancy of July It depends, moreover, on the kind of lens or lenses employed, double combinations working with about twice (and often, as in the case of quick, large aperture, "baby" lenses, with very much more than twice) the rapidity of single ones I can, however, offer one suggestion, and that is for the operator to determine finally the time he intends to expose his plate before he removes the cap from the lens, and when it has expired, let him not be troubled with any misgiving that the time has been too long, or be deluded by the idea that another moment will make no difference, but as the last second is counted, let the cap be replaced on the lens When this is done the exposure is over, and the shutter of the slide may be shut down. The dark slide itself should now be drawn out and conveyed to the dark room to undergo the process of development

Before opening the slide in the dark room, the operator should assure himself that there is in it no aperture or chink, however small, affording entrance to white light If such exists it should be promptly and effectually covered up, if it be allowed to remain, the plate will probably be covered with "fog" (a visitation which will be described and discussed in a future chapter) and rendered utterly useless Next a small portion of the positive developing solution should be allowed to filter through a funnel fitted with a filtering paper, into the measure specially set apart for it The lid of the dark slide can now be opened and the plate removed Care should be taken not to rend the film with the fingers, but to hold it throughout this and succeeding operations in one place, namely, at the corner at which it was held during the pouring on of the collodion When the plate has been removed from the dark slide, no change from its condition before exposure will be perceived The real change which has been effected is the impression of an image now latent; the object, then, is to make by development this latent image a visible one. To this end remove the funnel through which the solution has been filtering from the measure, and pour from the latter enough of the positive developer to cover the plate scantily without surplus Do not allow the solution to run over the edges, but, by gently rocking the plate, allow it to flow to the corners, and by degrees to act upon the whole surface of the film. In a few seconds, if the plate has been properly exposed, and the operations have been throughout correct, the image will begin gradually to appear, in the reverse tint to that which they exhibit in nature. Thus a white collar will seem black and a black coat white Moreover, as those parts of the picture which are in nature of a light tint, are those most powerfully acted upon by photographic light, the first object developed on the plate will appear a deep shade, and will represent what is light in the natural object. This reversion of light and shade is, however, only apparent when the picture is held up and looked through against a background of light. The reason for this is that the film, though in colour a dirty creamy white, is opaque, and as the natural whites are represented by those parts of the film which have been most powerfully acted upon, and the natural blacks by those which have been more or less thinned by the developer, when both are held up to the light the opacity of the whites obscures the light and makes them seem black, while the light shining through the transparencies representing the natural blacks causes them to appear white But if the picture is placed upon a background of shade, the results will be exactly opposite, and the picture will appear as in nature, the white film representing the natural lights, and the dark background apparent through the transparencies representing the natural shades The application of these principles will be seen when the picture is completed, and only requires to be made to represent nature as it is, instead of the reverse, by treating it in the latter of the two ways above described and explained.

During the process of development the operator should strive to equalise the action of the developer, and not let the solution remain too long on one particular spot. He should also watch carefully to catch the precise moment when the picture is fully "out" in every minute detail, as from that moment the developer remaining on the film does more harm than good. When he thinks the development completed, the operator should allow the solution to drain away (if he is of a saving turn of mind) into a little basin placed in the sink, whence it can be afterwards transferred to some bottle or jar, in which it may finally be put in the hands of any professional assayer The plate then should be thoroughly washed at the tap

It is now ready for the process of "fixing," which is to render it unassailable to the future action of light This is a very simple matter, but care should be taken to do it thoroughly, or those parts of the picture which have not been acted upon by the fixing solution will, on being afterwards exposed to light, turn perfectly black The Fixing Solution (*Cyanide of Potassium*, p 14) should be poured on while the plate is still wet, and allowed to thoroughly permeate the film. In a very few seconds, if the solution be of proper strength, a great change will take place in the colour of the film, the predominant tint losing much of its whiteness When all the parts of the image are uniformly and completely fixed, the cyanide solution can be allowed to drain back into the bottle, and the plate should again be thoroughly washed. This done, the operations requisite in taking a positive picture are virtually complete But to render it more suitable both for use and ornament a few further operations will be necessary, which are as follow —Allow the washed plate to dry either spontaneously or by the aid of moderate heat The latter is the most convenient course, as the plate, when dry, is naturally rather warm and in a fit condition to receive the coating of spirit varnish, which to some measure will protect the film and render it less liable to scratches The varnish can be poured on in precisely the same way as collodion, but the plate before varnishing should always be moderately warm After the surplus varnish is poured off, slight heat should again be applied for a few moments, when the plate is cool the varnish is dry, and the film can be touched without much of fear damage

It now only remains to provide the picture with a permanent background of shade This can be done in one or both of two ways. Either the plate can be allowed to rest on a piece of black velvet in a little frame, or the varnished side of the film can be coated again with varnish, this time of a deep black colour If the former course be adopted, the plate should rest in the frame, film downwards If the latter be preferred, there is obviously only one choice. When the positive picture is fitted into a little frame, which can be bought of a pretty pattern at a very low price indeed, it forms an attractive little ornament fit for any mantelpiece or table

In Chapter V I shall suppose my readers to have become thoroughly conversant with and proficient in the art of taking positives, and shall try to render them equally so in the more useful and attractive negative process, by which any number of copies on paper can, by a further application of sun-printing, be multiplied.

CHAPTER V

THE NEGATIVE PROCESS—COLLODION—SENSITISING BATH—DEVELOPER—INTENSIFIER—SENSITISING—LIGHT—EXPOSURE DEVELOPING—INTENSIFYING—FIXING

BEFORE commencing the process of taking negatives, the learner should set aside his "positive" chemicals, and carefully procure and prepare those which it will now be necessary for him to employ The first of these will be collodion, the ordinary iodised collodion used for positives being replaced by that specially bromo-iodised for the negative process The particulars relating to these two, and the difference between them, I have already explained (Chap II, p 12) In the same chapter I gave formulæ for other preparations used exclusively in negative work Amongst these was a formula for the negative sensitising bath, as distinguished from that employed in producing positives The most important point of difference between them is, that while the latter ought to be freely acid, the former, by which denser pictures are to be obtained, should be but slightly so The stereotyped test of acidity is blue litmus paper, the colour of which, when it is immersed in a solution containing acid, changes to different hues of red, according to the strength of the acid in the solution. A positive sensitising bath should, therefore, turn a litmus paper immersed in it to a fairly bright red, while a litmus paper dipped in a negative bath should only change to a faint pink, a few rather more comprehensive hints as to the management, under incidental difficulties, of the sensitising bath will be found in Chapter VIII

After the negative developer has been made up according to the given formula, attention must be paid to the preparation of the intensifier, which is one of the exclusive requisites of the negative process Unless it is to be used very frequently indeed, the "pyro" solution should not be made up in large quantities, as it is subject to rapid discoloration and diminution of strength. The silver solution, with which it is afterwards mixed, is best administered in a "dropping" bottle, which can be bought at any chemist's or photographic chemical vendor's for a shilling or eighteen-pence Many professionals and amateurs dispense with the separate bottle by merely adding to the pyro solution a few drops from the dipper of the sensitising bath, beginners, however, should eschew this in favour of the dropping bottle, which takes up very little space, and can be re-filled when necessary from a larger stock bottle containing an indefinite amount of the solution

And now for the manipulation which these negative chemicals will require After the glass plate (best polished sheet still being suitable, at any rate for a beginner) has been polished with great care, the collodion can be poured on in precisely the same manner as this operation was performed in the positive process. When the collodion is duly set, the plate must be plunged by means of the dipper, as before explained, into the negative sensitising bath and suffered to remain undisturbed for at least a minute, it can then be kept in vertical motion until the appearance of greasiness, arising from the repulsion of the water in the bath by the alcohol in the collodion, has completely disappeared After remaining in the bath for from one to two and a half minutes more, the plate can be removed and transferred, as in dealing with positives, to the dark slide

If the object of which it is desired to obtain a negative has, from want of a "glass room" or studio, to be operated upon in the open air, the photographer must make shift to control the light as best he can If a portrait is to be taken of a person sitting or standing against a wall, it will be necessary to place a screen a little above the sitter's head, this will serve to weaken the "top" light, which would otherwise, by its directness, cause the representation of the hair, &c, to be in disproportionate advance of the other parts of the picture, and therefore out of proper contrast. A useful implement in "lighting" is a large hoop covered with paper, like those employed in a circus, which can be held by a friend, to screen abrupt light from any part, especially the face, of the object Finally the operator should always, if possible, work with a northern light in preference to any other

The exposure required in the negative process, is about double that required under similar circumstances in positive work

When the exposure is completed and the shutter of the dark slide is closed down, the latter may, as before, be borne away to the dark room to be developed. After pouring a small quantity of the negative developer into its proper cup, the plate can be treated, as in the positive process, with the solution. If the plate has been properly exposed, the image will probably take from twenty to thirty seconds to appear in full detail, if under-exposed, the picture will take a long time to bring out, while over-exposure will cause the image to flash out all at once In the latter case, which is the lesser of the two evils arising from incorrect exposure, the developer should be washed off at once, in other instances this can be done when the lights and shades of the picture are fully attained The washing should be performed thoroughly, as the developer, in order that it may flow freely, contains a considerable portion of alcohol, which, as it is not contained in the intensifier, should be completely removed before intensification takes place

It is advisable to have, besides the ordinary every-day developer, a slightly stronger sample (made by adding two or three additional grains of the proto-sulphate of iron to every ounce of the water prescribed by the given formula), to be used when the image is more than usually reluctant, or in cases where the lights have been extraordinarily bright and the contrasts with the shadows very great When the developer becomes sluggish in cold weather, it can soon be brought to work well and rapidly by slightly heating it in a flask immediately before use

When the developer has been well washed away, it will be more easy to see whether the image requires intensification Experience alone can determine this, but, for a beginner, there can be no more useful help than a standard negative, which has been properly exposed, developed, and intensified, these are supplied by Frederick Cox, of 26, Ludgate-hill, at a shilling apiece—a moderate and really profitable investment

If, as is usually the case, the negative requires intensification, the plate can be allowed to drain while the operator pours into a small measure about quarter of an ounce of the pyro solution When this has been flowed over the film, it can be returned to the measure and receive the addition of a few drops of the solution of silver, and when this has, by the help of the dropping bottle, been accomplished, the mixed solution can be returned to the plate, and the intensification can be proceeded with until it is complete, if the intensifier become brown, it should be poured away and a fresh mixture substituted

When the intensification is completed (this, again can be determined with moderate certainty, even by a beginner, by a second reference to the standard negative mentioned above), the intensifying solution can be washed off and the image fixed, if desired, in the open light

If the operator has determined upon cyanide of potassium as his fixing agent, he can fix his negative as he would a positive, by merely pouring the solution over the film, letting it remain there until the yellowy-white iodide of silver of the shadows has been dissolved, and, finally, returning it to the bottle. I must not, however, leave this portion of the subject without again cautioning my readers against the reckless use of cyanide and other dangerous poisons, when substitutes can be procured, almost, if not quite, as effective, and having the merit of being harmless. If, however, in spite of warning, a beginner chooses to play with this particular "edged tool," he must be especially careful not to let it come in contact with any acid, for, if this is allowed to happen, hydrocyanic acid vapour (prussic acid) is given off, a consequence which I hope few if any will fail to comprehend

When hyposulphite of soda is used, it can either be applied like the cyanide, or, what is better, poured into a shallow dish, into which the plate can be put until the fixing is completed

When the image is thoroughly fixed, whether by cyanide or hypo, the plate should be thoroughly well washed under the tap, if this is not done, the picture, from the undue corrosion of the fixing agent, will be utterly spoilt

The plate being dry and slightly heated, the varnish can be applied exactly as in the positive process, and when this is accomplished, the negative is really completed and ready for the further process of paper printing, which, as I have said, will shortly occupy a separate chapter

Having now explained all the operations leading up to the production of a negative image upon glass, I shall, in my next chapter, try to give my readers some idea as to how a good negative may be known, and how a poor one may occasionally be improved

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CHAPTER VI.

HOW TO TELL A GOOD NEGATIVE, AND HOW (OCCASIONALLY) TO IMPROVE A POOR ONE

As the production of good negatives is, or ought to be, the first and chiefest aim of the photographer, it is highly necessary for him to be able both readily and certainly to tell whether, after due care and attention on his part, his attempts have or have not been crowned with success In acquiring this knowledge he will find another use for the standard negative, the purchase of which I advocated in my last chapter The beginner should study this negative carefully, observing how every detail of the picture is represented, and, above all, strive to work up to its level in his own productions If he wishes to try his hand at all the three *genera* of portraiture—groups, full-lengths, and vignettes or head-and-shoulder pictures—he should procure specimen negatives of all three, so as to facilitate reference to their several points of recommendation

For the benefit of those who from inexperience cannot criticise the faults of a bad negative, or, what is more difficult, appreciate the merits of a good one, I will do my best to describe, with as little technicality as possible, a picture of a group (taken in the open air) which I have before me. It must not be thought that I am speaking of a perfect negative, as the production of such an one in the case of a group of human figures in the open air is, for many reasons, almost an impossibility The chief defect which, owing to care in lighting and manipulation, is rendered as little noticeable as possible, is a want of the delicate roundness in the delineation of the features, which is only to be met with in nature and in the highest class of studio pictures. But passing this over as inevitable, it is a good specimen of open-air portraiture, and will yield very creditable prints I may add, emphatically, that the apparatus, &c , with which it was produced corresponds minutely with the instructions given on that head in my commencing chapters

But to proceed with my description. The picture itself represents three ladies grouped on a rustic bench, which stands in a corner, formed by the meeting at right angles of two garden walls Two of the ladies are sitting slightly apart on the seat itself, just behind, in the space between them, comes the figure of the third, who is seated upon one of the upright logs which form the back of the bench In the foreground, which is very slight, is a plant about 2ft high The walls, serving as a background, are covered with the leaves of a trailing vine, which have a singularly graceful effect Now, by laying the negative upon some dark body, say a piece of black cloth, which will serve as a background of shade, the picture seems to be a correctly outlined but unreasonably dense positive, on holding it, however, up to the light, and looking *through* and not *at* it (that is by transmitted instead of reflected light), the image appears brilliant and full of the minutest detail, both in its lights and shades, which are now, of course (see Chap IV) reversed. The lights and shades, too, are in perfect gradation of "tone," and exhibit abundance of a sort of mean of gradation between the "high" lights and deep shades, which is technically termed *half-tone*, and is a prominent qualification in a well-printing negative This correctness in the gradation of tone is a consummation devoutly to be wished by the beginner, who usually fails to attain it by faulty exposure, or from some other cause denoting want of experience rather than want of care

Another striking point in the picture is its exquisite clearness of definition throughout As there is little or no distance, the veinings of the vine leaves on the wall are almost as distinct as the straw plaiting of the garden hat which one of the sitters on the bench holds in her hand, or the flowers of the plant in the immediate foreground Of course such clear definition would not have been attainable without the help of a rather small diaphragm, but the light being good, and the operations taking place in free atmosphere, the exposure was by no means uncomfortably long

A third characteristic of the negative is the evenness of its lighting and its perfect freedom from the abrupt patches of light which so often ruin the otherwise pleasing effect of an open-air portrait or group These patches are caused, as I have explained before, by the falling of a direct ray of light upon some undefended portion of the object or objects. Their effect is apt to be underrated by beginners, who can often hardly discern their presence on the dull coloured film of the negative, but when the time comes for "pulling" a print, they will speedily be undeceived For instance, I am the possessor of a negative, which to an unpractised eye seems faultlessly lighted, but in the print from it one of the sitters has a bar of shade running straight across his nose, while the rest of the picture is lighted up in the most fantastic manner.

Abrupt patches of light can easily be obviated either by using the paper covered hoop, or by working when the sun is invisible and the light equably diffused These courses are to be adopted with advantage to the character of the shades as well as to that of the lights of the picture Thus in the negative before me there is *no absolute transparency*, which in printing would give a hard unyielding black

Above all my negative is practically as well as theoretically good, and produces in the printing frame natural and harmonious little pictures

Of course there can exist no surer criterion of the quality of a negative than the quality of a print from it, but by experience and a system of careful and minute observation, such as I have endeavoured to describe, the photographer may be able not only to weigh accurately the quality of his finished negative, but even, from the moment the intensifier has left the plate, to foretell the character of a resultant print

And now that some idea has, let me hope, been formed as to how the merits of a good negative may be duly recognised, I will proceed to the more uncongenial task of striving to remedy in some measure the defects of a bad one In nine cases out of ten this would involve a hopeless waste of time, and it is far better to wipe off the defaulter, sensitise afresh, and secure a second and perhaps satisfactory picture But it now and then happens that on looking out negatives for printing, you meet with one of some favourite object, of which you possess but this one souvenir, and are unable to procure another And it not unfrequently occurs that this particular negative, from some oversight or carelessness in manipulation, is a worthless one, and unfit for printing purposes Hence it is desirable to have it in one's power occasionally to utilise a failing negative, by removing or lessening those defects in it which prevent it from producing decent prints

To begin with, before any steps are taken, the negative should be strictly and closely examined This course will probably lead to the adoption of one of the three following conclusions (1) that the mistakes to which the faultiness of the negative is due are utterly irremediable , (2) that the negative presents an air of general incapability, but that there is no absolute reason why it should not ultimately be brought to the "sticking point ," (3) that there are certain slight defects in the picture which, if removed, would leave the negative in perfect printing order, or something so nearly like it that the success of an attempt would justify the trouble spent in making it.

In the first of these three cases, when the negative is ruined by some irremediable defect, such as faulty focus or a bad attack of "fog," a farewell must be taken of the object, and no time lost in setting about other and more satisfactory work

With regard to No. 2, there is a decided gleam of hope. The "general air of incapability" more often than not results from insufficient intensification, a mistake to which beginners are particularly liable An obvious remedy for this is to intensify over again, but this is to be accomplished in a peculiar way, and not with the ordinary "acid pyro" and silver Suppose the negative to have been varnished in the ordinary manner, proceed as follows Flow over the film a little alcohol or strong spirits of wine, which will have the effect of softening the set and hardened varnish Then add a few drops of tincture of iodine to 1oz of fresh varnish in a measure When the colour begins to resemble that of light port wine, flood the film with the iodised varnish In a very short time the film will absorb the non actinic colour of the varnish, and the reintensification is accomplished When this is done wash off what remains of the iodised varnish with a little alcohol, rinse under the tap, allow the film to dry, and revarnish it in the ordinary manner The mistake usually arising in this operation is a scepticism as to the extent of the change which has been effected This will soon be removed when a comparison is made between the prints from the negative before and after reintensification

Conclusion No 3 includes rather a wide range of contingencies The chief of these are pronounced transparencies on the film, which yield unreasonably deep shades in the print These defects can often be almost completely removed by an operation called retouching This is performed by means of a black-lead pencil, a paint brush and water colour or black lead powder and a paper stump The successful practice of retouching rises to the dignity of an art, and as such takes a high place in photographic commerce Many professional photographers send their really good negatives to be retouched by professional retouchers, a course which the amateur is welcome to adopt or not, when he has negatives worthy of this honour, for the present, if he has any skill at all with the pencil or brush, he should be content to have the power of obtaining creditable prints from poor negatives, which he would otherwise be compelled to cast aside

Let me suppose, then, that a print has been "pulled" from the negative which shows shadows too heavy for the other parts of the picture What is obviously required is to block up to a certain degree the transparencies in the negative to which these dense "blacks" in the print are due Laying aside the powdered black lead, and even the water colour, unless the transparencies to be blocked out are of considerable size, sharpen a good B pencil to a fine point and try its effect upon the surface of the film If, as is usually the case, the pencil refuses to "bite" on the smooth varnish, a little very finely powdered resin should be taken on the point of the forefinger, and gently rubbed, with a circular motion, over the parts to be retouched The negative can then be placed on a retouching desk or frame, such as may be bought, of ordinary quality, at any of the shops, for about 15s Failing a desk, a beginner can effect great improvements in his negatives, even by working against a window pane

Besides, by retouching and reintensification, a faulty negative can often, by skilful printing, be made to yield decent pictures A few hints as to various little ' dodges" in printing will be found in another chapter

The addition, by artificial means, of *clouds* to *landscapes*, will be discussed in a chapter entirely devoted to that branch of photography

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CHAPTER VII

Defects and Failures—Reasons and Remedies—Spots—Comets—Slipping Films—Lines—Crape, Pinhole, and Fog—Stains—Defects in Film Dissolved by Varnish.

Although up to the present moment the continuity of my descriptions relating to manipulations, &c., either in positive or negative work, has been little, if at all, interrupted by any mention of defects or failures, I trust I shall be far from discouraging any of my readers when I ask them to pay especial attention to the present chapter, on the ground that it will probably be the one to which they will have, hereafter, most frequently to refer. It is hardly to be expected that an art, capable of such exceedingly delicate results as photography, can be successfully practised without some slight drawbacks, or even an occasional failure. If the beginner is really disheartened by such *contretemps* he simply does not deserve to succeed. Moreover, in photography, failure is so comparatively rare, and so often owing to wanton neglect of simple and easily-followed instruction, that, in nine cases out of ten, the operator has himself alone to blame for any defect in his finished picture or mishap in preceding operations. There are, however, certain little troubles to be met with in photography, as in everything else, which are only to be overcome by experience or by turning to account a timely word of warning; it is to such that the present and two succeeding chapters will be devoted. There is a well-known saying of a Latin poet, which I will freely translate: "Happy is he who has acquired the power of knowing the reasons of things." This maxim I wish to be the key-note of any remarks applying on which it may be found necessary to make defects or failures. It is not enough to know that a picture is defective, nor even to be able to describe its failings in the most accurate and technical style; the knowledge which every photographer should seek, above all other, to acquire is that of probing, like a skilful physician, straight to the root of a difficulty; hence, to discover the nature of the source from which it springs, and, by removing or modifying this source, to prevent the recurrence of the failure, defect, or mishap After this necessary preface I will proceed to review the annoyances themselves.

The first and perhaps most frequently met with defect, both in the positive and negatives of beginners, is the presence upon the film of a host of minute spots, either transparent or opaque, or both A common cause of these is dust in the dark room, dark slide, or camera The tiny particles settle with peculiar tenacity upon the moist film, and usually remain invisible until development, when they are either washed off, taking with them a corresponding particle of the film and leaving a transparency in its place, or remain, forming an opaque spot which (in the case of negatives) will produce a white spot on the paper-print With regard to removing the source of this vexation, I can only reiterate my advice concerning dust, expressed in former chapters Possessors of dust-spotted negatives, doubtful as to their capabilities for producing respectable prints, will find that a transparent spot on any part of the negative representing deep shade can be left alone with impunity , while, if one occur in a sky or other "high" light, it can be readily removed by a stroke of the retouching pencil or brush Opaque spots can be dealt with *vice versâ* If a transparent spot occurs in a half tone, the beginner will perhaps find it best to block it (the transparency) completely out, and to work it into the paper print with Indian ink

Another fertile source of spotty films is collodion Spots and streaks caused by collodion are brought about in one of two ways either by the fall on to the film from the mouth of the pouring bottle, of particles of collodion from which the ether has evaporated, or by the sediment or "bottoms" being shaken into suspension, and flowing along with the collodion when the latter is poured over the plate Imperfections arising from the first of these two causes are designated by the expressive name of "comets," and can, as I have before explained, be obviated by the use of a "cometless" bottle The remedy usually prescribed for spots caused by particles floating in the collodion itself is filtration through one of the ingenious collodion-filters now sold at all the principal shops , but I perceive in the *Photographic News Almanac* for 1878 such a reasonable protest by M. Piquepe against this practice that the least I can do is to give my readers the benefit of his valuable opinion His argument is decidedly against filtering as a means of removing impurities in suspension, and as decidedly in favour of decantation. He observes most justly that filtration cannot fail, in some way or another, to destroy the proportion in which delicate preparations such as collodion are made up , moreover, as M. Piquepe continues, "it frequently happens that the cotton-wool which is generally used for filtering (even when previously washed with alcohol) will let slip in the collodion a great many particles, which, perhaps, imperceptible to our eyes, will not fail to make their apparition under the influence of the developer, and to each particle will correspond on the negative a deep transparent pinhole, or long thin line, which produces a deplorable effect'' But by decantation, i e, by allowing the liquid to settle and all impurities to sink to the bottom, and then carefully decanting it into some other vessel, the collodion is kept in its original proportions and in a state of brilliant clearness The process is, moreover, as simple as it is efficient Those who are unwilling to be convinced by the summarised argument to which I must necessarily limit myself, will find M Piquepo's able little paper on pp 112-114 of the *Almanac* His remarks on the destruction of original proportions apply also to the remedy often suggested for thinning collodion, which, by evaporation of the ether, has become thick, and flows with difficulty, by adding more ether to replace that which has been lost Although an experienced operator may occasionally avail himself of this convenient remedy, a beginner should attempt nothing of the sort. It is to these slipshod atonements for mistakes, due solely to utter carelessness, that a great portion of the eccentricities so often attributed to the really excellent collodions and other photographic preparations of commerce, is really due If he keeps his collodion bottles (large and small) thoroughly well stoppered, the operator will find that he loses very little collodion by evaporation, and if an ounce or so at the bottom of a bottle does get a little thick, it is a far better plan to use it up in some other way, such as cleaning glass, plates, &c, than to attempt promiscuous doctoring with other /

Besides "comets," streaks, and spots, there is another little trouble which the beginner will probably encounter in connection with the collodion It sometimes occurs that when subjecting a positive or negative to a stream of water, after development, the film suddenly peels off the plate, and disappears down the sink To remedy this annoyance he must go back to the pouring of the collodion on to the plate The most frequent cause of "slipping films" is undue haste in sensitising the collodionised plate The collodion should be allowed to set thoroughly, and until it does so should not be allowed to enter the sensitising bath If allowed to dry the film will be of a horny character, and its sensitiveness materially impaired The exact time between collodionising and sensitising is a matter which a very little experience will decide

Lines on the film can generally be traced either to a stoppage in the motion of the hand which let the plate down into the sensitising bath, or by the imperfect flow of the developer over the plate The cautious addition of a little alcohol will usually remedy this last defect "Crape" has been already mentioned, see Chapter IV, p. 22.

The sensitising bath is such an universal scapegoat for all kinds of defects and failures, from "pinhole" to "fog," that, to save repetition, "the sensitising bath under difficulties" will be treated at considerable length in a separate chapter

Stains on the film are to be traced almost always to the dark slide. They are defects which ought never to be allowed to appear, and are the direct product of carelessness They are caused by the refuse silver solution flowing downwards from the wet plate and contaminating the silver wire corners of the plate carriers The remedy for this nuisance is the employment of small pads of blotting paper to catch the refuse drops After the removal of every plate the wet pads should be thrown away and replaced by dry ones The operator should make a point also of continually wiping out both dark slide and camera with a wet cloth to prevent accumulation of dust

The chief defects in intensification are such as I have described, with some hints as to their removal, in Chapter VI In fixing, if the iodide is not sufficiently dissolved out by the fixing agent, a dense yellowy bluish veil is left on the portions undissolved, which produces, from the absence of any gradation of tone, a corresponding want of contrast in the paper proof. The cure for this defect is obvious

In varnishing, the most unpleasant contingency (fortunately of not very frequent occurrence) is the evanescence, by dissolution, of the film the moment the varnish is flowed over the plate This is owing to the spirit solvent in the varnish being stronger than the spirit solvent in the collodion, sometimes the addition of a little water to the former removes this annoyance

Besides the above defects and failures, there are, it is true, several others of more or less importance, these, however, are so obviously due to neglect in following given instructions, that any mention of them would necessitate a complete recapitulation of the preliminary chapters of this series If the beginner follows the instructions given him with proper care and attention he will be amply rewarded by having to contend against none of the difficulties which neglect of them entails, while he who wantonly passes over important points of instruction, because they happen to be "a wee bit dry," fully deserves the pleasure of having to turn back and master them

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CHAPTER VIII

THE SENSITISING BATH UNDER DIFFICULTIES—FOG, ITS CAUSES AND CURE.

As the sensitising bath is the most important element of the wet collodion process, it is only natural that from it more numerous and more perplexing difficulties should arise than from any of its fellow operations It is for this reason that I have postponed any mention of such difficulties until the list of defects and failures, for which other stages of the process are responsible, was complete In this chapter, too, I shall make mention of "fog," as, although it is occasionally due to other causes, its appearance is so often connected with the state of the sensitising bath that any account of one apart from the other would involve much unnecessary prolixity and repetition

It must not be thought that it is a law of photographic nature that the sensitising bath should be in a constant state of ill behaviour—quite the contrary A bath, fairly used and fairly cared for, will often produce as good negatives at the end of three or four months as it did on the first day that it was tried On the other hand, in spite of all possible precautions, it may begin to show the cloven-foot in a few weeks or even days. What is to be done with it under such trying circumstances as these is always a source of much vexation of spirit to the beginner. The usual advice given to all amateurs is that the moment the sensitising bath gets out of order it should be promptly discarded and take its place among the residues in the waste tub. This is a highly convenient system, and those may adopt it who choose, especially in the case of a well worn and aged bath that has done good work for two or three months, and is beginning to show signs of serious indisposition, but, unfortunately, the beginner is frequently under the delusion that his bath is at fault, when it is nothing of the kind. In a case like this to throw away a carefully prepared bath, which has, perhaps, only been in use for a few days, for the mere reason that the owner imagines something is wrong with it, and is unwilling to take the trouble of going to the real root of his misfortune, is more often than not sheer lazy folly To lessen the possibility of my readers falling into habits like this I will now endeavour to give some idea as to the *bonâ fide* difficulties arising from the use of the sensitising bath, how they may be traced, and how sometimes avoided, a course, to say the least, more satisfactory than that of merely treating the (presumably) faulty bath as practically useless rubbish, for which a certain price will be given by the assayer, whose industry is only too often employed in repairing the effects of his customer's indolence

The causes of the defects for which the sensitising bath is responsible may be conveniently distributed under two heads The *mechanical*, or those which arise from carelessness in manipulation, miscarriage of apparatus, &c , and the *chemical*, or those due to the imperfect or too vigorous action of the chemical compounds with which the use of the bath is connected Of the former kind of defects the chief are the tiny opaque or transparent spots, of whose appearance in connection with other stages of the wet collodion process, I warned my readers in my last chapter. As they are due to precisely the same cause, I trust the repetition of my warning will be all but needless But, simple as the remedy may seem to prevent dust and other impurities from entering the bath, they frequently make their way into it, in spite of all fancied precautions, and promptly manifest their presence by attaching themselves to the collodion film while the latter is being sensitised As in the case of dust-spots contracted both before and after sensitising, the particles either remain imbedded or are dissolved out, thus producing, as the case may be, transparencies or opacities The dust can be to a great measure driven away from the bath solution by keeping the bath in a case with a hinged cover, such as I recommended in Chap III This cover should be kept rigorously closed down, except when the plate is being plunged into or drawn out from the bath It should not be shut down with a bang, as the slightest jar will often displace an incredible amount of dust. If, after all, the solution does become full of "mechanical" impurities, the directest remedy is to pour the solution into a measure, filter, or, what is better (see Chap VII), allow to settle, and carefully decant back into the bath, which should have been previously washed out with distilled water to remove impurities adhering to its sides. If filtration or decantation be inconvenient, a pretty certain method of obviating dust-spots arising from the sensitising bath is to have, in addition to the hinged support on which the case mainly rests, another similar support on the other side of the case, so that the bath can either lean towards or away from the operator Of course the former will be its position whilst the plate is being plunged into it, but when the plate reaches the bottom the case can be safely turned over so as to lean the other way, until the plate requires agitation or removal. By this means the chance of particles of dust settling on the film during sensitising is materially reduced, but though a safe, it is a somewhat inconvenient remedy.

A source of impurity in the bath, often overlooked by beginners, is want of care in cleaning the glass plates, the evils arising from which are a continued source of trouble to the slovenly operator.

And now for a specimen of the class of "chemical" defects Transparent spots on the film are not alone due to dust or "mechanical" impurities An even commoner cause is excess of iodide in the bath solution The transparent spots thus produced are known as "pinholes," and can generally be distinguished from those due to dust by their minuteness and total occupation of the whole surface of the film

The usual cure recommended for pinhole is to dilute the bath solution with its own bulk of water, filter, and add fresh crystals of nitrate of silver to make the new solution up to its proper strength Thus, if a 35 grain bath of 8oz shows signs of pinhole, another 8oz of distilled water should be added, the whole 16oz filtered, and 280 grains of nitrate of silver dropped into it Another cure now very frequently adopted for the removal of pinholes, and one which does not necessitate doubling the quantity of the bath solution, is to add to the latter about 2 grains to the ounce of *nitrate of baryta,* agitating and filtering This often proves a certain and lasting remedy, but frequently misleads beginners from the appearance on the plate, during development, of a bluish veil, which does not disappear after fixing This is due to the sulphate of iron in the developer precipitating the baryta as an insoluble sulphate, the bluish colour, however, almost entirely departs on the application of the varnish

When the bath has become contaminated by some foreign chemical substance, as, for instance, ether, which enters through the medium of the collodion, an almost unfailing remedy is to *sun* the solution This is done in the following manner The bath is poured into a clean glass measure, and carbonate of soda is added until a litmus-paper immersed in it no longer turns pink, this is called neutralisation The bath is then left in the sun for a day or two. When the sunning is completed, it will be found that all the impurities have sunk to the bottom of the measure in the form of a black sediment. The solution can now be either filtered or carefully decanted, it must finally be acidulated by cautiously adding glacial acetic acid until the faint pink tinge in the litmus-paper is once more given.

Many photographers are in the habit of constantly sunning their bath solutions, even though no trace of pinhole has appeared in the negatives produced by them, this, doubtless, reduces the chance of pinhole to a minimum.

Besides ether, the collodion film introduces alcohol into the bath A solution which has been used for a very long time will necessarily become strongly impregnated with alcohol, a common cause of lines on the film To get rid of the alcohol, the solution must be boiled, so as to allow the spirit to evaporate This can be done by setting a large evaporating dish containing the solution to be boiled on a stand, and introducing below it a Bunsen gas-flame When, however, matters come to the boiling point, I advise my readers to desist Sunning and doctoring baths are all very well, but boiling is another thing A bath does not want boiling until a great many negatives have been produced from it, as the quantity of alcohol which remains to contaminate the bath after the immersion of a collodion film is, if the collodion has been given fair time to set before immersion, exceedingly small Hence it is quite worth while for the amateur to turn out his alcoholic old veteran into the waste-tub, and let the assayer have the trouble of rejuvenating him

There is yet another difficulty connected with the sensitising bath, which, although it is not of very frequent occurrence, should be included in a list of "defects and failures" It is a repetition of those transparent spots on the film, two reasons for the appearance of which (dust and excess of iodide) I have already given But the manner of their appearance is different instead of showing themselves on the application of the developer, they reserve their energies until after the image has been fixed The reason for this is exactly the reverse of that to which "chemical" pinhole is due—instead of excess, there is insufficiency of iodide in the sensitising bath This is brought about as follows whether by the number of plates which have been sensitised in it, or to accidental waste by spilling, &c, the bath solution becoming thus, in the course of time, decreased in quantity To bring it up to its necessary volume a solution of nitrate of silver, about thirty-five or forty grains (according to the original strength of the bath) to the ounce of distilled water, may be added. If the decrease is owing to the natural absorption of the solution by a great number of films, there is seldom need for any further addition to the simple silver solution employed to replace it, as the iodide imparted during the immersion of the plates, coated as they were with iodised collodion, will probably have been sufficient to keep the bath in order. If, on the contrary, the bath is comparatively new and the diminution in its quantity is owing to some portion having been spilt, or otherwise used up in circumstances where the necessary loss of iodide is not compensated for in the replenished solution, the case will be different, and the results will be the post-fixation pinhole previously mentioned. Insufficiency of iodide arises also frequently from extensive sunning and filtration The obvious remedy is to add as many grains of iodide of potassium as may be found necessary to bring the iodide of silver up to its proper strength, or, if there is not any iodide of potassium handy to add to the under iodised bath, another course, quite as simple and effectual may be adopted—a glass plate with ordinary bromo-iodised collodion, and leave it immersed in the bath for about an hour. On the removal of the plate it will be found that the iodide of the collodion has been completely eaten up by and absorbed into the former

Some photographers iodise their baths in the first instance by leaving a collodionised plate immersed in an acidulated silver solution for a lengthened period, but, as the long immersion involves the liberation (in infinitesimal quantities, it is true) of alcohol and ether as well as of iodide, it is as well, when iodide of potassium is handy, to use it The other course, however, has always the merit of being convenient, and the knowledge of its efficacy will often be found a useful "wrinkle"

And now for my long promised account of "fog" This terrible apparition may be simply described as a dense veil-like formation on the film, which appears during development, and which, by producing from its non-actinic colour irregular patches of white in the print, more often than not renders the negative useless Its causes may be distributed under four heads—over exposure, admission of promiscuous white light into the dark slide, camera, or dark room, alkalinity of the sensitising bath, and deficiency of acetic acid in the developer In order to give a clearer idea of the manner in which fog may arise from any of the above sources, I will once more adopt the plan I have already found so convenient—I mean of placing myself in the same predicament as that from which it is my object to teach my readers to extricate themselves, and of detailing my mode of procedure under the influence of an imaginary attack of fog

Before commencing, however, I wish to remind all that the steady and methodical patience essential in tracing with success the causes of fog is only a type of the temper in which other little photographic mishaps should be encountered It is far better, if a hitch occurs, to come voluntarily to a dead stop, and to render oneself familiar with its *raison d'être*, and the course to adopt in the event of its recurrence, than to lose "nine stitches" hereafter from lazy neglect of the "one in time"

But to proceed Let me suppose that, on pouring on the developer my plate discovers unmistakable signs of fog. To begin with, instead getting out of humour, I calmly, after a few more sweeps of the developer to see if more fog is in store, wash and fix the film I then inspect it carefully, in order to determine, if possible, my basis of operations I shall find that the film is either partially or wholly covered by the foggy veil In the former case, especially when the patch is sharp and angular, the fog is usually due to the "admission of a promiscuous ray of white light" Under an impression like this, I should immediately take a cursory view of my dark room, striving to discover an accidental chink in the woodwork or a tear in the orange paper with which the window is rendered non-actinic, the dark slide would next be subjected to the same scrutiny, and finally the camera itself If any defect capable of producing fog were met with, I should promptly rectify it and try another plate If, however, my general search were unrewarded with success I should test the room, slide, and camera separately, in a way I shall presently describe Failing these, I should proceed as if in the first instance I had taken no notice of the film being partially or wholly fogged

If the fog flashes out at once all over the plate, I know there is some serious fault in the apparatus, the chemicals, or the manipulation My first step is to sensitise a fresh plate and expose it for a considerably less time than I did the first and faulty one If after this the plate developes cleanly, it is evident that the fog was due to over-exposure, this is often the case with beginners, whose only idea is "to make sure" of a speedy development

Having satisfied myself, however, that over-exposure is not the error into which I have fallen, I have recourse to another experiment I develop the next plate with a portion of developer into which has been dropped about a minim of *glacial acetic acid* If the weather is hot, or if the developer has been carelessly mixed, it is very possible that the insufficiency of acetic acid is the real cause of my trouble

After, or even before (to save the trouble, perhaps, of having to prepare an extra plate) the condition of the developer has been called to account, a simple and important test should be put to the sensitising bath Thinking, with good reason, perhaps, that I have got at last to the root of the evil, I pour a little of the bath solution into a small measure I immerse a blue litmus paper in the solution for a few seconds, if the colour changes to a faint pink, I know that the bath is duly acidulated, and that I must turn my researches in another direction If, on the contrary, the litmus paper does not change its colour, I see that the fog on my negatives is due to the alkalinity of the bath. Pouring the whole of the bath into a large measure, I cautiously add drops of glacial acetic acid until the blue litmus paper changes on immersion to its proper pinkish hue

In the event of the litmus paper showing on its first immersion that the bath is in good order, it is necessary to retrace one's steps a little I have proved conclusively that there is nothing in the exposure, nothing in the developer, and, finally, nothing in the bath conducive to fog The one point on which I have not thoroughly satisfied myself is the question of 'promiscuous light'' I therefore prepare a plate with the view of testing the non-actinic qualities of my dark room When removed from the sensitising bath, I simply lay the plate down on the table and leave it for a few minutes untouched I then treat it with the developing solution as I would an exposed film If the fog appears, my dark room has pleaded "guilty" quite as plainly as in words, and I do not rest until the defect is discovered and set right

When the dark room is at fault the blame can generally be laid to the window Operators should take especial care to render this incapable of fogging even the most sensitive plate, but at the same time there is no need to resort helplessly to the plan of blocking up the window altogether, and working by the dingy light of a candle It is far easier and (photographically speaking) more workmanlike to paste over the panes two or three thicknesses of orange paper than to spend boards, nails, and time in shutting out altogether the light of day

To test the dark slide, a sensitised plate should be inserted exactly as if for exposure in the camera Instead, however, of taking its place in the camera, it should be placed by itself in the open light for perhaps a minute Development will quickly decide whether its construction or condition is at fault

The camera I should prove by inserting the dark slide and pulling up its shutter without removing the cap from the lens The proof will lie, as before, in the result of the development

If none of the above "researches" succeed in unearthing the causes of fog (a contingency highly improbable), the sensitising bath should be sunned as directed at the commencement of this chapter This will serve to eliminate all particles of foreign matter which occasionally have a foggy tendency.

It will be understood that, although I have given the above system for tracing the causes of fog as the one practised by myself, I do not mean to say that I personally never depart from it For instance, to waste a plate on testing for over-exposure is the last resource on which I, as one whom experience has taught to regulate exposure by fixed and seldom erring rules, would care to fall back It is in instances like these that a practised hand may bend a system to suit himself, and I hope this fact will lend additional weight to the caution I give to beginners—on no account to take any liberties whatever with prescribed systems or methods, of the very elements of which they are all but ignorant

CHAPTER IX

WET COLLODION IN THE FIELD.

BEFORE commencing any detailed description of the apparatus necessary for taking landscape negatives, it will be as well to sketch briefly the nature of the distinction which it is necessary in this point to draw between photography at home and photography abroad The first question which arises is an obvious one It is quite possible to convey to any given place the camera with its fittings and tripod But suppose the spot which it is required to photograph is some miles away from home, and even one negative, not to mention five or six different ones, are wanted, how is the dark room to be dispensed with? Now, this problem can be solved in two distinct ways The first method is to prepare in a peculiar manner the plates at home previously to starting on an expedition, and to take them out, expose them, and bring them back in a dry state This is called dry-plate photography, and from the facility it affords to tourists and others to whom the smallest burden is of consequence, is daily growing into favour with many photographers, both amateur and professional But in spite of the improvements which, from time to time are being made in "dry" processes, they are always subject to one great drawback—the operator is never certain of success, for it is impossible to tell whether a good picture has been secured until home is reached and development performed This difficulty is completely overcome by a second method of landscape photography, to which the present chapter will have especial reference In it wet collodion is still the *primum mobile*, and the dark room is represented by a portable box or tent, or combination of the two, which the operator carries with him, and in which he prepares and subsequently developes as many plates as he may chance to require. That such a portable dark room is a possibility I shall show hereafter, when I come to give a separate description of a dark tent with its complement of bottles, tank, sink, &c But if the operator is to carry his dark room bodily for a distance perhaps of five or six miles, it is absolutely necessary for the rest of his apparatus to be eminently portable likewise. As some guidance is necessary in choosing a portable and at the same time efficient outfit for the practice of wet collodion in the field, I will now proceed to give a few instructions, by following which an intending landscape artist will profit not only in the point of comfort but in successful results

The first point which (putting aside the question of the dark tent) demands attention is the size which the operator wishes to make his standard in taking landscapes, and the consequent size of the camera in which his pictures are to be produced Now, if my readers will take my advice on this point, they will go to some well-known dealer, and procure of him what is known as a Stereoscopic folding camera There is no necessity at all to use these instruments exclusively for stereoscopic pictures They are almost invariably sold with an extra front, which enables the operator to take landscapes on the full size of the plate, usually about 7½in by 5in They should be fitted with a "double swing-back" and a "winch screw," which is highly convenient for focussing They have always a central movable partition, which is used in taking stereoscopic pictures, or two carte-de-visite portraits on one plate A camera such as one of these costs from £4 to £5, and is always a thoroughly reliable and generally useful piece of apparatus

We must now turn to the lens, which is a most important point The ordinary landscape lens is a single combination, formed of two or three lenses joined together with transparent cement But this single combination is subject to a fault, which at times is most inconvenient, namely, that of distortion This is not noticeable in taking ordinary landscapes, but it is most annoying when photographing a house, or any other such object, to find all the marginal lines completely "out of the straight" There are certain classes of lens, doublet and triplet, which correct this distortion Of these the most noted are Dallmeyer's "Rapid Rectilinears," one of which every landscape photographer should, if he can afford it, procure Their rapidity makes these lenses especially useful in cases where animate objects form part of the picture They can even be employed with success in taking portraits Ross's Portable and Rapid "Symmetricals" are also fine and justly celebrated anti-distortion lenses In confined situations, where the angle of the ordinary single or doublet lens (usually from 60 to 70 degrees) is not wide enough to take in the whole of the picture, a "wide-angle" lens is necessary These can be bought if wished to cover the whole plate without stops , but a simpler and cheaper plan is to buy a lens covering the size below the one in ordinary use, and to increase its angle as well as its definition by the use of stops Thus, a 5in. by 4in rectilinear or symmetrical can, by the use of a small stop, be made to take very wide-angle pictures up to 7in by 5in If the operator can only afford to buy one good lens, he should by all means get a doublet of some maker of undoubted reputation I may remind my readers that there are several most respectable shops at which genuine lenses of such makers as Dallmeyer, Ross, Grubb, Steinheil, and others may be procured secondhand at a great reduction, considering the little or no deterioration to which lenses, however rough, may have been their usage, are subject. Although it is very pleasant to have one's lenses direct from the manufactory, still, for those to whom expenditure is a serious consideration, it is a far better plan to have a lens with a good maker's name on its tube, however tarnished and dented the latter may be, so long as the former is clear and brilliant, than to have a wretched piece of bad flint set in fittings of resplendent brass, which was bought because it was as cheap as it was new

From the camera and lens to the tripod is but a step There are many kinds of portable tripods on all sorts of principles One that can be thoroughly recommended is that for which Mr Kennett, of Maddox street, has obtained a patent Its chief peculiarity lies in sliding ferrules, by which the legs of the stand are adjusted These legs are removable from the slab on which the camera rests, and can be easily carried under an arm or in a disengaged hand

A good kind of glass plate to use for small landscapes is flatted crown Many photographers also employ Forrest's patent plate substitute, which is a glass of good quality, and is sold at a moderate price The glass plates should always be thoroughly cleaned before starting on a photographic expedition This done, they can, until they are wanted, be kept in any common white wood box, grooved to prevent scratching Only as many glasses should be taken out as will be required for the day, as glass is very heavy, and plate boxes with a great number of grooves very clumsy If the operator prefers before leaving any spot to varnish the negative he has just taken of it, these finished negatives can be brought home along with what remains of the clean plates If, however, he desires to store them away the moment they are washed after fixation, with a view to varnishing them at some future period, he should procure a metal box specially adapted for the purpose of receiving wet negatives. These are sold by the dealers for about six or seven shillings apiece

When the operator has procured the above indispensable apparatus for the comfortable and successful practice of outdoor photography of any kind, he can turn his attention to the construction and furniture of the dark tent, which I shall now proceed to describe

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CHAPTER X

DARK TENTS AND THEIR CONSTRUCTION.

OF all the so-called "dark tents" the simplest in construction and design is that which is known, from the inventor's name, as the "Howard" This "unique and portable little dark room," as the advertisement very fairly calls it, is made of indiarubber lined cloth, and is so constructed as to have for its supports the upper part of the legs of an ordinary camera-tripod It is fitted with eye-holes and armholes, and also with a "window" of non-actinic cloth, capable of admitting quite as much light as is needed To sensitise and develop, the operator sits down on the box in which he carries his chemicals, &c The whole concern is a convenient and easily adjustable little apparatus, and for working small wet collodion plates in the field nothing handier can be desired The tent will also be found useful in changing dry plates when double dark slides or a changing box are not accessible Its price, exclusive of the stand, which is not required, any good camera tripod being suitable, is £1 It can be procured of most photographic dealers, but the sole manufacturers are Lee Brothers, 27, Watling-street, E C The accompanying woodcut shows at a glance the nature and principle of the Howard tent

But it will be seen that, ingenious and efficient as the above explained apparatus indisputably is for pictures up to, say, 5in by 4in, when plates of larger sizes, such as whole plate or even 7½in by 5in, are o be manipulated, something more substantial will be required The form usually employed in such cases is the "Box" tent, of which there are many varieties, both commercial and otherwise Of the former, the best known are the "model" tents of W W. Rouch, 180, Strand, which are very perfect and convenient. A tent for working plates up 8½in. by 6½in, complete with fittings, costs between £6 and £7, and the outlay once afforded will never be regretted by the true photographer To those who are either not in a position to purchase a tent ready made and fitted, or who prefer to make their apparatus to suit their individual convenience, I will give a few hints on the construction of a fairly portable box tent,

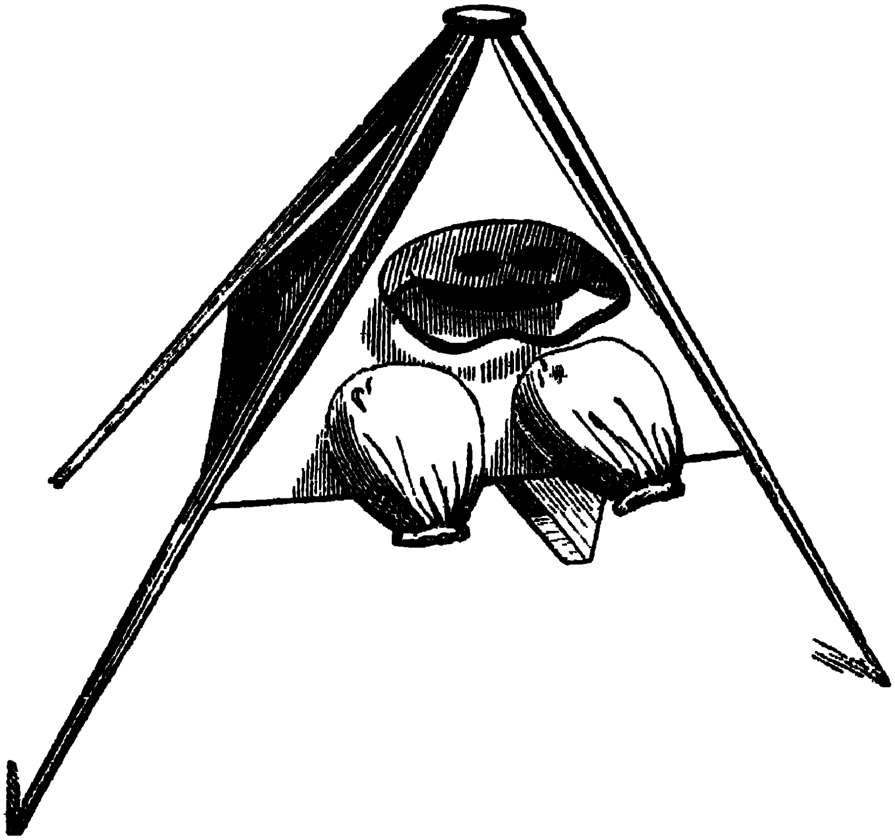

FIG. 4. THE HOWARD DARK TENT

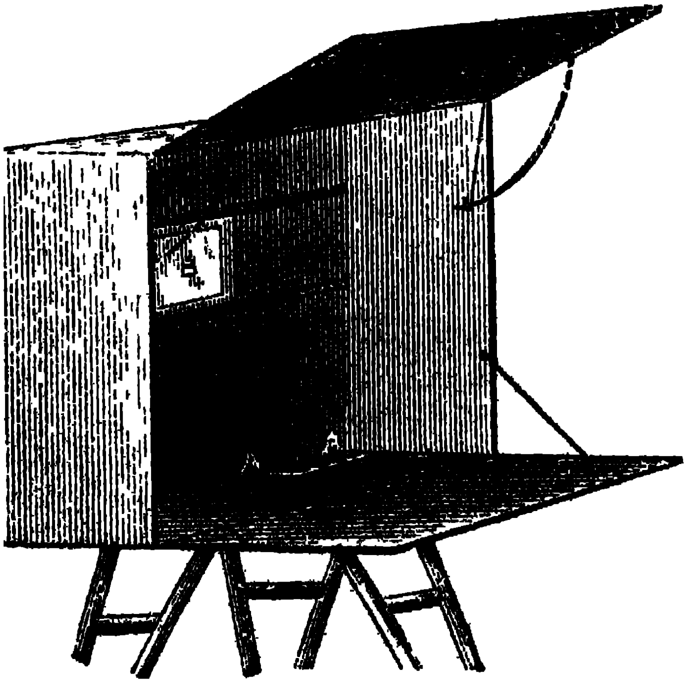

FIG. 5. THE BOX DARK TENT

which, though of course unequal in completeness and finish to the many varieties in the photographic market, will still be found workable and, comparatively speaking, inexpensive Annexed are two illustrations on which my hints will be based.

Fig 5 represents the box tent without fittings It is a plain box (preferably of deal, for the sake of lightness), with two doors like those of a cupboard turned on its side The upper door opens on a slant rather higher than the top side of the box itself, and forms a roof; the lower door opens "flush" with the bottom of the box, and is used as a support for the sink The two doors shut down on a rabbet, one must be secured to the inside of the box with a bolt, and the other fastened to its companion with a lock In most, if not all, commercial box tents there is but one lid, which falls down altogether to form the bottom board. The roof is formed by a curtain supported by two iron rods When this plan is adopted the box can be very shallow, and the camera, &c., has to be carried apart from the tent. My tent, on the contrary, is made a little deeper, so as to carry all the apparatus except the tripods for the camera and tent, when travelling,

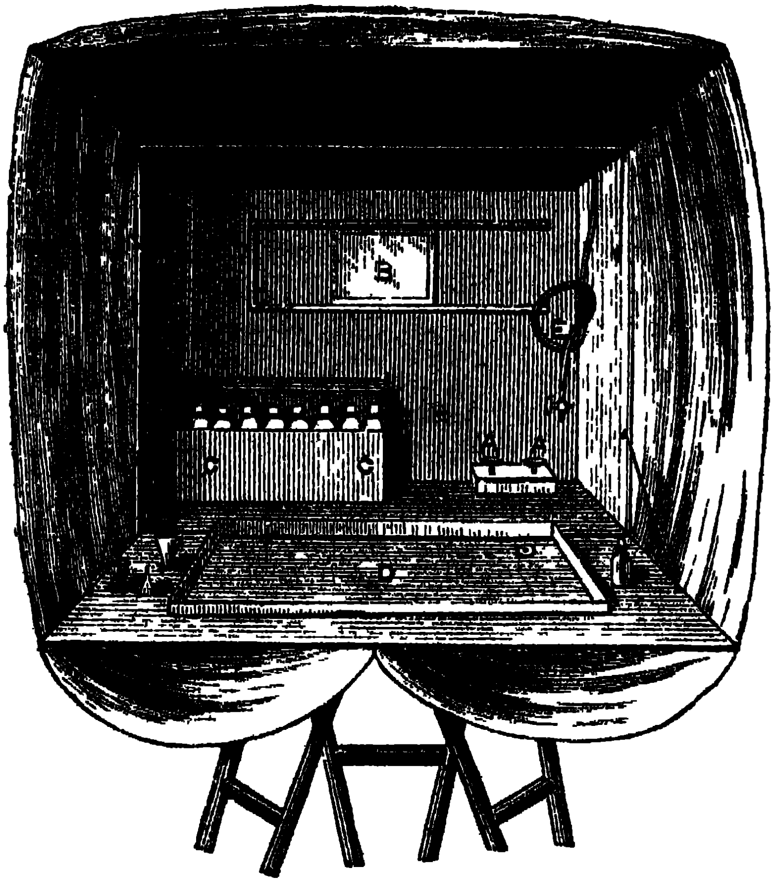

FIG. 6 THE BOX DARK TENT, COMPLETE.

in itself, an arrangement which I am perhaps heterodox in preferring, but which my readers can modify or not as they please The measurements for a tent as shown in the engraving may be—length 2ft, height 18in, depth 6in or 7in For a tent with one door or lid, the depth need not be more than 4in To proceed with my description in the bottom of the box, at A A, is cut a slot, about 6in long and 1½in broad, according to the size of the bath it is required to hold The window is represented at B The sash should either be hinged or made to slide in grooves, as in the illustration Let us now turn to Fig 6, which represents the tent with its fittings in action The first point which attracts notice is the curtain This should be made of black "jeanette" lined with yellow It should be carefully tacked, so as to admit no ray of white light It need not be too voluminous, but only sufficient to shield the operator without cramping his manipulation It is a good plan to have the whole curtain converging like a bag to one point, where it can be drawn together by a tape, the ends of which can, during operations, be tied round the operator's waist At A A in its receptacle is seen the bath

An ordinary porcelain or glass bath can be used, and can rest obliquely in a cradle of non-actinic cloth, but as this necessitates double decantation and the inconvenience of an extra bottle, it is advisable to carry the solution in a "travelling" bath with water-tight and screwed top If the operator can afford it, he should also procure a dipper of pure silver wire The cost is about 12s, and, of course, breakage is next to impossible At B is the sliding window again, which should be opened as soon as the collodionised plate is safely in the bath, to let out the fumes of the collodion A case to hold bottles is shown at C C The necks of the bottles should be secured by intermediate wires to prevent contact with one another and consequent fracture. The case should be rendered compact by a slide at its top, to prevent the bottles falling out while travelling, and to serve as a support for odd bottles, &c, during operations It is best perhaps to use corked in preference to stoppered bottles Stoppers are liable to drop out unless very well ground, and are always subject to breakage To render the bottles in the case of an uniform height, blocks of wood of proportionate sizes should be placed at their bases. D represents the sink, which should be, if possible, of ebonite In one corner it should have a waste pipe, which penetrates the bottom of the tent and leads the water by means of a tube to the ground. At E is another tube, with a tap (an ordinary gas tap is serviceable), communicating with a tank or indiarubber bag, which rests on the top of the tent.

Besides these fittings a plate box or two (see Chap IX) will be necessary

I recommend my readers at the end of a day's work, before packing up the tent, to heat their negatives over a spirit lamp, and to varnish them there and then This course does away with the necessity for an extra plate box , and it is always satisfactory to think on returning home that one's work is virtually finished, and that nothing remains to be done but the printing If, however, the operator objects to this plan, he can use whichever of the plate boxes happens to be empty, to carry his measures, funnels, &c In some tents the receptacle for these is a fixture, but space is gained by having it movable, as, during operations, it can be laid on the ground or on the top of the tent If an indiarubber bag is not used for water, the zinc tank can be made with a lid, and the odds and ends of apparatus packed into it

Besides the usual complement of measures and funnels for large plates a pneumatic plateholder is required, to relieve the fingers of the weight, enhanced by the leverage attendant on holding it by the extreme corner, of a large sheet of glass Pneumatic plate holders are made of two different kinds, one in which the pneumatic attraction of the plate to a piece of indiarubber is caused by lowering a small lever, and which is known by the name of the "lever" form , the other in which the same result of attraction is obtained by merely squeezing the indiarubber ball which forms the lower part of the holder This is known as the ' globe" holder, and is very handy for home use In the field the lever is perhaps more generally convenient

The legs of the tent-tripod should be removable from the slab or iron frame on to which the tent itself is screwed , the latter can then be carried in the tent, while the former may be strapped into one parcel along with the legs of the camera-tripod

If the operator finds his tent with all its appurtenances likely to tax his strength, especially when long journeys are attempted, he should devise a light "trolly" on wheels, which, while greatly facilitating carriage, is by no means difficult to construct or troublesome to put in action If the operator is lucky enough to possess a friend or attendant to help him with the tripods, and, if water be not within reach of the spot where the tent is pitched, with the water bag, such a convenience as the above mentioned may generally be dispensed with.

I shall now conclude this chapter with a few hints which may prove useful in several ways to those, especially the beginners, who are taking up the study of landscape photography.

One of the great secrets of success in landscape photography is to study a subject thoroughly before attempting to reproduce it with the camera and lens If possible, the photographer should visit the future scene of his operations some time before doing actual work there He should then carefully select such points of the surrounding landscape as he considers would make really satisfactory pictures, and study these individually and with the utmost care His motto should be that if a picture is worth taking at all, it is worth taking well Above all he should strive to make his productions not only evidences of manipulative skill, but witnesses to his artistic taste This is a point where ninety out of a hundred landscapists fail egregiously, and one to which the great artist photographers of the day are drawing the particular attention of their less successful brethren It is not enough to seize indiscriminately on every object which you think "will make a tidy picture," and then without more thought to prepare a plate, insert a tiny diaphragm in your lens so as to have the whole picture, distances and all, uniformly sharp, and finally to produce a tolerable printing negative. This is photography in one sense, but certainly not in its most elevated and elevating sense The photographer may be indignant if his performance of certain manipulations in connection with certain chemical agencies, is not freely admitted to be a form of "art," yet the truth is that "merely this and nothing more" is not art at all, any more than the man who produces a cast from a mould is an artist But more words would be superfluous. If you watch the artist photographer at his work and try to catch the spirit in which he works, or minutely analyse his finished pictures and place them side by side with the productions of the every-day landscapist, you will learn far more about the application of art to photography in an hour than you will gather from volumes of dissertation But do not suppose that because you are, or imagine you are, endowed with artistic perception and taste, you can be altogether independent of mechanical knowledge This is a great and often met with error The true path to excellence is to learn your manipulation thoroughly at home, to render yourself by careful and constant practice familiar with every article of apparatus in your employ, to acquaint yourself with the action of all the chemical compounds in your laboratory, and, above all, to acquire patience and determination. This done, you may with some conscience take the field, and learn your first lesson in the art-practice of landscape photography.

Having made up your mind to photograph on some fixed day, it will be well, as I said above, to begin by a previous visit to the spot where you think there is a prospect of obtaining satisfactory pictures. After selecting such points of interest as you consider likely to make good photographs (in doing which care must be taken to bear in mind the distinction between the polychromatic hues of nature and the monochrome of the silver print on which nature is to be reproduced), it is a good plan to mark with sticks or stones the spots from which you roughly compute that each landscape will have to be focussed Now take the views separately, and map out as nearly as possible your plan of action Especial attention must first be paid to the disposition of light and shade throughout the pictures Having settled on such effects as your artistic taste, innate or acquired, suggests, note these carefully down, together with the time of day at which they may be secured, in a pocket-book kept for this particular purpose Note down also such alterations in the normal state of the landscapes as you may deem desirable , the addition of inanimate objects, such as branches of trees, the presence of a flock of sheep, a herd of oxen, a group of human beings, &c Remember that these three last require very delicate and skilful handling Their chief use is to relieve a meaningless expanse of foreground , but, to accomplish this properly you must never lose sight of nature or natural posture It is the preservation of the harmony of nature, and the total absence of any trace of artificial aid, that is the real criterion of success in an attempt to make what is inartistic accord with the principles of art

When such points as the above, in reference to your future landscapes, have been disposed of, attention should be turned to the mechanical arrangements which the production of the negatives will necessitate A primary consideration is the position of the tent This should obviously be as central as possible to the focussing stations of the various views If a running stream is at hand the tent should be pitched upon its banks The question of a handy and abundant water supply is a very important one in outdoor photography, and the operator should take especial care in making all previous arrangements with regard to it If a stream be not accessible, water may be obtained in pailsful from a neighbouring dwelling Should this source fail, the photographer must fall back upon himself and bring his water on his shoulders in an indiarubber bottle or bag

Before actually starting on your photographic expedition, make a point of going over your whole equipment to make sure that nothing is missing. To facilitate this, a list may be made of the articles required in one day's work, and be used as a muster-roll both for apparatus and chemicals Another plan is to go through mentally the operation of producing a negative away from home It is as well to carry along with one an extra measure, funnel, and so on, as the slight addition to the weight of the equipment is nothing compared with the pleasurable sensation of being on the safe side which the endurance of it gives.

The sensitising bath should be tried before starting Nothing is more vexatious than to find, after a toilsome march of perhaps several miles, that a picture cannot possibly be taken without pinhole, fog, or other similar abominations New collodion should also be tested, especially if it is some prepared by another maker to the one usually patronised. I may here remark that nothing is more conducive to failure in landscape photography than the constant alteration of formulæ and chemical preparations "What is one man's meat is another man's poison" is a proverb the truth of which photographers are amongst the slowest of mortals to comprehend The only piece of advice to be given on this point may be summed up laconically into—find out the formulæ which lead you to excellence, and, as the Americans say, "freeze" to them.

Let the glass plates be thoroughly clean and bright, requiring only a touch of the camel's hair brush to render them fit to receive the collodion This exhortation to cleanliness applies to all parts of outdoor apparatus, in which, from the necessarily small space available for manipulation, the smallest speck of dirt is almost felt

Let us suppose, however, that all difficulties have been overcome, and that everything is clean and in working order, and finally that the scene of operations is fairly reached The first task will be to pitch the tent upon the spot previously determined This perhaps occupies but ten minutes, but still it is better, if possible, not to move the tent until the day's work is completed, even though some of the focussing stations are rather remote The chances are that not only will the tent and apparatus have to be moved, but water will have to be fetched from the same place after all, or loss of time will be experienced in a variety of other ways.

When the tent is duly pitched and the apparatus unpacked and made ready for action, the landscape, for taking which the present is a favourable moment, may be focussed This is an operation which, apart from artistic considerations, would require some little practice to render the operator proficient In the first place he should remember to base his focus upon some point half way between the centre and the edge of the view as it appears on the focussing screen When this is perfectly sharp he can proceed to insert a diaphragm to impart a certain degree of sharpness to other points of the picture, which with the full aperture of the lens appear hazy and wanting in clearness of outline But I must caution my readers against the indiscriminate use of stops They are most valuable little instruments, it is true, but an undue employment of them often leads to inartistic effects. Look, for example, at the production of some ordinary landscape photographer Your first thought is one of admiration, and you exclaim "How exquisitely clear!" But after a moment's reflection you find that this very clearness is a real disfigurement You look again, you see that the mountains miles away in the background are as bright and sharply outlined as objects which were not more than fifty yards from the lens You know well enough that this is not nature, and so did the photographer, but either the idea failed at the time to strike him, or , as is occasionally the case, he chose to ignore the fact altogether But this last is a habit I trust my readers will not be guilty of falling into Although a disregard for distances may be a widespread error, it is certainly not conducive to its removal to humour it, nor creditable in him who has the knowledge of what is artistically right to do violence to his opinions and those of the better informed among his critics, by producing pictures untrue to nature, and to the natural law that as an object recedes from view the distinctness of its outline is lessened to the eye Then, before yielding to the temptation of using the smallest of the stops, so as to make all sure, think of the gradation of distance you wish to reproduce, and you will find that to obtain your object, and at the same time to gratify your wish for sharpness, the largest, rather than the smallest, stop will be your choice

After focussing comes the preparation of the plate If some distance is to be traversed between the camera and the tent, it is advisable to lay a strip of blotting paper the whole length of the bottom side of the plate carrier A sheet of the same may also be laid at the back of the plate itself If a pneumatic plate holder be used in collodionising, the back of the plate should be wiped clean before it is allowed to enter the bath If this is not done, impurities will be constantly carried into the bath, which, from their minuteness, it will be difficult to eliminate

About the exposure in landscape, as in portrait photography, no fixed rule can be given. The stereotyped general rule is to expose for the shades and let the lights take care of themselves Among the former, trees hold a prominent position Their colour is highly non-actinic, and so requires a lengthened exposure

If, during exposure, a sudden gust of wind threatens to tear the whole landscape to rags, the cap can be at once put on the lens and removed to complete the exposure when the squall is over.

Never work, if you can by any means help it, with the sun in your face. Either at your side or at your back is its most manageable position If, however, facing the sun is unavoidable, a cap or hat should be held so as to screen it from flashing directly into the lens

With this I shall conclude my "hints" to those of my readers to whom landscape photography is either a present or a future study In development and succeeding operations there is nothing which calls for special remark With good formulæ and plenty of practice failure in these is almost impossible But in the artistic treatment of a picture this is not the case No amount of formulæ will make a man an artist, but the simple explanation of the simplest of art rules will go far to give him a slight glimmering of artistic truth, and when this has once dawned upon him the daybreak is not so very far behind

CHAPTER XI

PAPER-PRINTING, WASHING, TONING, &c

THE present chapter is based upon an important assumption Hitherto my instructions have tended, I trust, consistently to the realisation of one fixed object, the production, namely, of satisfactory negatives From the hypothesis that these instructions have been accurately and successfully carried out, the *rationale* of the process I am about to describe will be deduced I have said elsewhere that from a negative by a process of sun-printing upon prepared paper, copies of a given subject can be indefinitely multiplied I will now proceed to justify this remark by giving in detail an account of the various operations which, combined with the possession of a decent negative or negatives, will procure the above-mentioned results.

The subject will require but little scientific preface The discussion of two points only will be sufficient to give the learner a grasp of the principles on which the theory and practice of paper-printing are founded These points are, firstly, the discrepancy , secondly, the analogy between the production of prints and that of negatives The discrepancy arises in the nature of the sensitive materials on the action of which both processes are respectively based In taking negatives the most ordinary agent is *iodide* of silver, in producing paper prints from them *chloride* of silver. The action of light upon the former of these I have fully exemplified. To illustrate its effect upon the latter, and to show how this effect is to be obtained, is the object of the present chapter But while this discrepancy exists in the nature of the sensitive materials themselves, there is a direct analogy in the manner in which the sensitive film or surface is in either case prepared Looking back to the wet collodion process for obtaining negatives, we shall find that a plate was coated with a substance (collodion) containing an iodide , this on immersion in the sensitising bath became impregnated with iodide of silver. In paper-printing the paper is treated with a substance containing a chloride and afterwards floated upon a bath of silver nitrate. This produces a film of silver chloride which possesses the necessary property of darkening when exposed to actinic light

The most ordinary method of imparting the chloride to the paper is to coat it with albumen This gives an exquisite evenness of surface, and if carefully applied is a sure basis for successful prints Albumenised paper is an article of extensive commerce, and can almost invariably be procured of excellent quality The paper itself is usually sold of two different qualities, *Rive* or *Saxe* The former is, on account of its brilliant gloss, more suitable for small pictures, the latter from its strength for prints of a larger size

Having the paper at hand, and having fixed upon to-day or to-morrow for taking a turn in the printing department, the first question to be decided is the selection of the negatives to be printed from, the next, the number of prints required from each negative When the latter is settled and the quantity of paper which the total number of prints will consume has been calculated, the sheets can be cut into convenient sizes prior to their being floated upon the sensitising bath These sizes should be somewhat smaller than that of the dish in which the bath is to be contained, and at the same time must obviously be multiples of the size of the prints required If desired to print from nearly the whole surface of a quarter-plate, the albumenised paper can be cut into whole-plate sizes for sensitising, and afterwards sub-divided when required for the printing frame Four whole-plates will be found in every half sheet of commercial paper When cutting out paper for printing it will be found necessary to allow a slight space all round for trimming off the rough edges previous to mounting

The bath in which the paper is to be sensitised should be made up in any quantity to the following proportions

SENSITISING BATH FOR PAPER

Nitrate of Silver	50gr
Distilled Water	1oz

It should be used in a porcelain dish, and when done with for the time can be filtered off into an ordinary bottle. When the solution becomes discoloured a little kaolin can be dropped into the bottle, and the whole well shaken; the kaolin having settled, the solution can be decanted or filtered off as required into the dish for ordinary use.

As the strength of the solution becomes by use diminished, it is necessary to test it from time to time by an instrument called an argentometer. This is a bulbed tube containing quicksilver, which shows by index figures on its stem the number of grains of silver to the ounce of water in any solution in which it is immersed. When the argentometer shows a deficit of silver in the sensitising bath, all that is required is to drop silver nitrate into the bath until the necessary number of grains to the ounce is once more indicated by the figure on the stem of the testing instrument appearing just over the surface of the solution The price of an argentometer is about half-a-crown.

Having prepared the sensitising bath according to the given formula and made ready the paper in flat pieces of a convenient size, the operator can now proceed to the task of making the paper sensitive to light This is done as follows: Pour the bath into a porcelain dish so as to allow a depth of not less than half an inch Now take one of the pieces of paper, albumen side downwards, by the extreme ends, between the finger and thumb of each hand, bring the hands together as if about to fold the paper, lower the paper until the centre of the albumenised surface just touches the solution, finally, bring down the ends gradually until the whole albumenised surface floats on the bath If this is done with care and due attention to the golden mean between hesitation and hurry, all air bubbles (which, if allowed to exist, will produce sharp round spots of white in the print) will be easily expelled When the paper has floated on (but not in any way immersed in) the solution for from three to four minutes, according to heat or coldness of the season, a pair of boxwood or ebonite forceps can be applied to a corner and the paper removed from the bath The pieces can now be fastened to American clips, and hung up away from dust to dry It is obvious that all operations connected with the sensitising of the paper and the subsequent drying should be performed in the dark room, or at least in non-actinic light. When the paper is dry it can be cut down to the sizes (leaving, as I have said above, some space for trimming) of the prints required This done the pieces can be stowed away for the time being in a light-tight box of any kind

With paper prepared as above, it will be necessary to proceed almost immediately to the printing, as the paper itself becomes discoloured even in the course of a few days. If desired to preserve it in its original whiteness for some weeks or even months, some special method of making it durable must be adopted. The best formulæ to produce this result are trade secrets; but the following, suggested by Mr Hopkins in the *Photographic News*, may be employed with success. Take any number of sheets of blotting paper and immerse them in a solution of carbonate of soda, about 30 grains to the ounce of water. When these have been dried insert between alternate sheets of blotting paper sheets of newly sensitised paper which have been almost thoroughly dried Put the pile under pressure and withdraw the sheets as from time to time required.

Another plan which can always be relied upon is to buy the paper ready sensitised of some standard dealer It is, of course, compulsory that the sensitised paper of commerce should be very durable, and there are in the trade several secret processes by which this result is most successfully obtained A commercial paper which, while it keeps almost indefinitely, gives most brilliant prints, is that sent out in a sensitive state by C Durand, No 3, The Grove, New Wimbledon, S W That supplied by J Fallowfield, of 36, Lower Marsh, Lambeth, S E, is also of standard quality Ready sensitised paper can be purchased at about 15s the quire.

Let me now turn to the printing frame in which the sensitised paper is to be brought into contact with the negative. The ordinary teak wood frames, such as I have recommended for quarter-plate work, have merely rebates, on which the negative rests, and a jointed back, the pressure of which is accomplished by a couple of brass springs The frames for larger sizes have a front of plate glass, which allows any sized negative from the full size of the glass front downwards to be printed in the frame These have cross bars, and the pressure is given either with springs or screws The jointed back is on the same principle as that fitted to the little teak wood frames Its object is to allow the operator to watch the progress of the printing without disturbing the position of the paper How this is effected will be presently described

The construction of the printing frame having been discussed, I can now proceed to describe its practical application Place the frames face downwards, and clearing away the pressure springs or cross bars, remove the jointed back, in the rebates, or in the centre of the glass front, lay a negative, film side upwards, in immediate contact with the film place the sensitive surface of the prepared paper, at the back of the paper lay a strip of felt or blotting paper, and over this introduce the jointed back of the frame, finally, close the springs if the frame is a teak wood one, if one with cross bars and screws, shut down the former and give the pressure with the latter The preparations for printing are now complete, and all that remains is to carry out the frames containing the negatives, &c, and expose them face upwards to actinic light.

When the frames have once been taken out from the dark room into the open light, the operator, especially if the number of negatives printed be large, must be prepared to give them his undivided attention until the work he requires of them is completed. In the first place, he should exercise some judgment in assigning to the different frames their respective positions as regards the light in which they are to be exposed All the dense negatives may be printed in bright light, the thinner ones in the shade. When the printer imagines the light to be taking effect on the sensitised paper he can examine the progress of the print in the following manner Take the frame into the shade and unfasten one of the two springs or bars which keep down the jointed back This will allow one half of the back to be pulled open, and half of the print can also be seen without disturbing the position of the other half, by pulling it back with the finger When the progress of one half of the print has been ascertained, the corresponding half of the jointed back can be shut down and the rest of the print viewed in exactly the same manner This course can be adopted with all the frames until the requisite degree of darkness has been attained by each individual print

With regard to the amount of exposure requisite for a vigorous and brilliant print, it is only necessary to say that the print (which at this stage is a dull red colour) should be allowed to remain in the frame until it is a few degrees darker in tone than that which it is wished for the finished picture to exhibit When this point is reached, the prints can be removed from the frame by undoing both the springs and lifting out the back entire, another piece of sensitised paper can then be laid over the face of the negative and the fastenings closed, as in the first instance The prints as they are removed from the frames must either be carried into the dark room or thrown into a light-tight box As soon as the number of prints required from a negative is complete, the negative itself should be stored away for fear of accidents, which, if the glass plates are allowed to lie carelessly strewed about, are at this stage very liable to occur

From the actual process of printing I will now proceed to the operations which unite to produce certain effects more prominently visible in the finished picture There are two principal points in which the print in its present stage is deficient (1) it is of a most crude and unpleasant "tone," (2) it is sensitive to actinic light, and if not kept away from its influence will turn uniformly black To remedy the first of these difficulties, the prints must be treated with the gold toning solution in the following manner Take a batch of the prints and wash them face downwards in two changes of ordinary water The washing, which must be done very thoroughly, will occupy about five minutes, the last change of water must be free from any trace of milkiness When by this washing the "free nitrate" has been removed from the prints, the latter are ready for immersion in the toning bath This is to be prepared according to one of the following standard formulæ —

TONING BATH (1)

Chloride of gold ..	1gr
Acetate of soda ..	30gr.
Water	8oz

This must be mixed at least a day before use. It will keep for almost any length of time, but occasionally requires strengthening; this may be accomplished by adding as much gold as is necessary to start the toning action afresh. It is best to keep the stock of chloride of gold in solution, as in its original state it is very deliquescent, and is highly inconvenient for measuring off A good plan to adopt is to break open the small tube in which chloride of gold is usually to be obtained, and immediately to dissolve the gold in a certain proportion of water The proportion generally followed is 15gr of gold to 3¾oz of water, that is, 1gr of gold to every 2dr of water. To make up a toning bath according to the above formula, the acetate of soda (30gr) may be dissolved in 7oz 6dr of water, and 2dr of the gold solution added

The following is also a standard bath, which gives beautifully rich purple tones —

TONING BATH (2).

Chloride of gold	1gr
Phosphate of soda	20gr
Water	8oz

A drawback to the use of this bath is the fact that it must be used shortly after preparation

A third toning bath is the following, which keeps its power of giving excellent results for a very lengthened period

TONING BATH (3).

Chloride of gold	1gr
Chloride of lime	1gr
Prepared chalk	½ teaspoonful
Water	8oz.

The prints to be toned in this bath do not require a thorough preliminary washing, as the presence of a small quantity of free nitrate is desirable

During the immersion of the prints the bath containing the toning solution should be gently rocked, so as to allow the latter to have free access to all the prints The operator will also find it bad economy of time to attempt to tone more pictures at once than the bath will conveniently hold If the toning does not go on satisfactorily with the prints floating face upwards, they can be turned over on their faces, which is perhaps the preferable course of the two.

When the prints have lost their originally brick-red hue, and have acquired a suitable tone, they can be removed from the bath with the forceps and plunged into a dish of cold water to await the process of fixing If some time is to elapse before this takes place, the precaution may be taken of dropping into the water a few grains of common salt to retard the toning action, which would otherwise, though very slightly, be continued.

The strength of the fixing solution may be as follows

FIXING BATH FOR PRINTS.

Hypo-sulphite of soda	4oz 5oz.
Water	20oz. 10oz

Strong

The prints should remain immersed in this bath for about a quarter of an hour They should be kept in pretty constant motion, and all air bubbles removed As hypo-sulphite of soda is extremely cheap, the amateur will find it best, and almost necessary, to throw away the bath when done with, and prepare a new one every printing day After fixing, it is requisite to remove by very thorough washing all the hypo-sulphite of soda from the prints themselves If this is not done the prints will rapidly fade away and become valueless The washing may be done in the following manner After a slight preliminary immersion they should be subjected, if possible, to a running stream of water for at least five hours If running water is not to be had, the time of washing should be increased to eight hours, and the water changed frequently

When the soda has been thoroughly removed, the prints can be dried between blotting paper and made ready for mounting The trimming can either be accomplished at this stage or immediately after the prints have been taken from the frame Perhaps the former is the more satisfactory course, as, during the long immersions the print has to go through, some papers are liable to distension, which, though slight, necessitates a second trimming, or materially detracts from the appearance of the mounted picture Glass shapes of different sizes for trimming are sold at the shops for from about 6d upwards, according to the size The cutting should be done with a knife, a special form of which adapted to this purpose can be bought for 9d or 1s In trimming large prints, or those with rounded corners, a most useful and handy little instrument is the Woodbury trimmer This has a cutting wheel mounted on a pivot, which will easily follow almost any curve

And now comes the operation of mounting, which, simple as it may seem to the inexperienced beginner, really requires some little care to render it successful. In the first place, it is necessary to fix upon a standard mounting solution. Perhaps that most generally used, particularly for small prints, is one compounded of starch and hot water The starch should be dissolved in water and used whilst warm, of a tolerably stiff consistency. It can be applied to the back of the picture with a brush or with a sponge Care should be taken to apply an even surface of paste, and to pick out or remove by application of a piece of blotting paper, all lumps or grit, which would, if they were allowed to remain, impart a very poor and unworkmanlike appearance to the print when mounted on the card When the whole of the back of the print has been thoroughly well rubbed with paste, it can be gently laid on the card or mount, the two top corners having been adjusted to their respective positions, and the rest of the print lowered into contact with the card surface. This done, and the print being exactly placed on the mount, a piece of blotting paper can be laid over the former and the hand passed two or three times smartly over it This will expel the superfluous solution and give an even surface to the mounted picture.

Amongst other mounting *media*, besides starch paste, are dextrine and gelatine, both of which require, like starch, the addition of water. The latter requires a preliminary swelling with cold, and a final dissolution in warm water Ready made-up mounting solutions can be procured of any photographic dealer, that with the widest reputation is perhaps the "mounting medium" manufactured by Messrs Marion and Co, 22 and 23, Soho-square, W.

The choice of card mounts must be left to the taste of the photographer himself A buff coloured card with a gold or red line to show off the picture, answers admirably, and is moreover cheap A packet, containing a hundred of these to take cartes de visite, costs about two shillings, and from the neat appearance it gives to a print is an outlay where a slight saving need hardly be considered

When the print is firmly mounted upon its card it should be put under pressure for some little time, after which its production is virtually complete To confer, however, a highly finished appearance, the course is often adopted of burnishing the print by passing it under a heated or cold roller of steel Amongst the more pretentious class of rolling machines, suitable for pictures of large size, are Weston's Rotary Burnisher (to be had of J J Atkinson, 33 and 37, Manchester-street, Liverpool), and Entrekin's Oscillating Enameller (sold by Edwin Oborne, Red Lion-square, W C) J Solomon, of 22, Red Lion-square, also sells a strong well made machine, which is known as his "hot rolling press," complete with gas burner or spirit lamp for £3 (carte-de-visite size), or £4 for a press to take cabinet pictures An amateur, however, working in small sizes, will probably find a small double-geared rolling machine amply sufficient to meet his wants in every way These can be bought with two bright steel rollers and a screw for adjustment of the pressure for about 30s apiece To obviate the trouble attendant upon keeping the rollers bright and free from rust, these can be bought nickel-plated for a few shillings extra. This is a great advantage, as the nickel does not even tarnish, and can be cleaned with water alone.

In the larger machines there is generally a bed of steel, or thick glass, between which and the roller is passed the mounted print In smaller burnishers the card is introduced between two rollers, a suitable pressure adjusted, and a turn given with the handle. This forces the whole length of the card between the rollers, and, according to the extent of the pressure, imparts a brilliant and burnished appearance to the surface of the print.

Subsequently to rolling, or, as a partial substitute for it, many photographers are in the habit of applying a waxy substance, known as *Encaustic paste*, to the face of the picture. This can be bought in pots at the shops, or made up according to the following formula given in the *British Journal Photographic Almanac*

ENCAUSTIC PASTE

Pure Wax	500 parts
Gum Elemi	10 "
Benzole	200 "
Essence of Lavender	300 "
Oil of Spike	15 "

This paste is to be rubbed into the print with a tuft of cotton wool until a glossy and even surface is secured

I have now completed my description of the manner in which prints are to be in an ordinary way produced For the sake of brevity and directness I have reserved some few additional instructions as to producing peculiar varieties of pictures, such as vignettes, medallions, &c, together with some few hints observable in printing generally, for a subsequent chapter For the present the beginner will find plenty of occupation in practising printing even from a standard negative procured from a friend or shop Undignified as this may seem, it is a really capital course for the beginner to adopt, and far more reasonable than for him to waste good materials on producing prints, the faults of which he is slow to refer to the worthlessness of his first few negatives.

I must again remind my readers of the opportunity (alluded to in Chap II) afforded to amateurs and others of having their negatives printed from by professional printers To those who have barely time to produce the negatives themselves, it is a great boon to be able to reap the palpable fruits of the contents of the plate box they have laboured to fill, at a moderate expense, and with a far more satisfactory result than nine times out of ten they could themselves obtain

It will be a fit conclusion to this chapter to say a word about the two new sizes which the practice of printing has brought to light The first of these is *carte de visite*, which is the size of a print measuring when trimmed 3½in by 2¼in, and the second is called a *cabinet* or album picture, which is a trimmed print, measuring 5½in by 4in In order to produce in the negative a picture suitable for reproduction in a certain printing size, it is a good plan to lay the glass trimming shape in the centre of the ground side of the focussing screen, and to draw a pencil round it. This is obviously as correct a guide of size in focussing as can possibly be followed.

CHAPTER XII

VARIETIES OF SILVER PRINTS—HINTS ON PRINTING

IN my last chapter I gave an account "pure and simple" of the operations requisite to produce an ordinary print from an ordinary negative. In many instances the instructions there given would be sufficient to carry out the process with success, but there are certain cases in which, either from necessity or from a desire to add to the appearance of the print, some points in it must either be enlarged upon or modified For example; in the case of a negative of a bad landscape, or perhaps of a group, or even of a full-length portrait, it will be only necessary to follow out the line of instruction prescribed in Chap XI But in the case, say, of the kind of picture which is familiar to all under the name of *vignette*, it is obvious that some modification must be adopted. It is a common error to suppose that the vignetted appearance is given to a picture by some peculiar method of taking the negative, but this, except that the negative should only comprise the head and shoulders instead of the whole figure of the sitter, is not in any way the case. Vignettes, in common with medallions, domes, cushions, &c, are all produced in the course of printing, and as cases are constantly occurring where the addition of some such ornament has a material effect on the appearance of the finished picture, it is important that the amateur printer should be familiar with the modes of producing it.

I shall begin with the simplest kind of what I may almost call ornamental prints—those, namely, in which a clean white margin is shown in the print itself, giving to the latter a "domed" or "cushioned" shape. This effect is produced by the use of cut-out "masks" of black or non-actinic paper, which are either pasted on to the negative or used loosely. In the first case care should be taken to adjust the mask in exact truth with the objects shown in the negative, otherwise a permanent distortion will take place in all the prints. The mask must also be pasted on the collodion side of the plate. In the latter case, which involves a little inconvenience, but which has the advantage that one mask can be used for any number of different negatives, the mask is laid loosely but accurately as before on the film side of the glass negative (for if the contact of a mask both with the film and the sensitised paper be not perfect, it is obvious that a "fuzzy" margin will result), and the sensitised paper is placed behind The frame is closed down and exposed, and the print appears with a clean white margin of the shape exhibited by the cut-out portion of the mask

From these I will proceed to medallions, which, though of the same nature as domes and cushions, and produced in the same way, are liable to certain modifications which are either unsuitable or impossible of application to those classes of pictures Medallions are commonly of an oval shape, and are used, like vignettes, principally for showing up a head-and shoulder portrait The background for a medallion ought not to be too dark, as the resulting contrast is then disagreeably pronounced Again, a simple medallion, where the picture is merely a clean oval set in a white "mounting," is rarely effective, it lacks relief, and its unnaturalness is too prominent to be pleasing This, however, can be to a great extent removed by adopting a course like the following Procure a cut-out medallion mask, and with it the paper oval corresponding to the inside of the cut-out Paste the latter upon a piece of glass of a size corresponding to that you are employing for your negatives Print from the negative with the cut-out mask, so as to produce an ordinary medallion picture Now take the frame into the dark room and release the print Lay the latter upon a handy flat surface, and over it superpose the plate with the paper oval The oval must be in contact with the print, and must exactly coincide with the medallion produced by the cut-out mask The glass plate will keep the print flat, and insure contact between it and the paper oval The support, the print, and the oval can now be taken out into the open light, and exposed until the margin around the oval has been slightly darkened. On returning to the dark room the print can be released, and it will be found that the new mounting, which by toning can be made to assume almost any hue, has advantageously replaced the original white one The above operation is called double-printing, and often proves of great service Masks for the production of dome, cushion, and medallion pictures are obtainable of any photographic dealer. The amateur should procure, if possible, those manufactured for the trade by Mann and Fursman, as they are cut of very true and symmetrical forms and up to almost any dimensions.

The photographer should be careful to use his masks with judgment and taste, as, while the employment of them often leads to a most satisfactory and pleasing result, their abuse is the cause of many feeble and inartistic effects

The course is often adopted of giving relief to a medallion, and occasionally to a vignette with darkened ground, in a very simple and decided manner After the picture has been mounted, the card is passed through a screw embossing press This is fitted with dies of suitable sizes, which, under pressure, produce corresponding reliefs in the mounted prints. Pictures embossed in this manner are called "cameos," and are often a great improvement on the flat surface of the ordinary card A "cameo" press, with dies, can be bought for about 10s or 12s

"Vignettes" require a separate explanation, as they are produced in a somewhat different manner from medallions and other ornamental prints where the masking is effected by paper with clean-cut edges. The chief feature in a vignette is the delicate softness of its edges, which adds peculiar effect to a comparatively large-sized reproduction of the head and shoulders. The instrument usually employed in making vignettes is that known as the vignetting-glass. This is a glass plate of any of the photographic sizes, the centre of the surface of which is transparent, but the edges of a deep ruby colour, which is very non-actinic This vignette-glass is laid over the glass side of the negative, either inside or outside the printing frame, in such a manner that the light will only be admitted to the sensitised paper through the oval or pear-shaped transparency in the centre of the plate As the contact is not perfect, the edges of the oval-shaped image on the print are not "clean," as in a medallion, and at the same time the edges of the transparency in the vignette-glass are so toned down with a due gradation of non-actinic colour, that the print is not irregularly "fuzzy," but rather exhibits a pleasing and regular softness

The vignette-glass is sometimes replaced in printing by vignette-papers, which can be procured of J D Waymouth, Nailsea, near Bristol, and of most dealers. Mr Waymouth sells a packet of twelve assorted for cartes at 2s The price of vignette-glasses of carte size is about 6d. apiece. It is necessary when printing vignettes with vignette glasses or papers to confine the exposure of the printing frames to the shade.

In taking the negatives for medallions and vignettes, of course only the head and shoulders of the sitter need be reproduced The sitter should be so focussed that his or her mouth will appear as nearly as possible in the centre of the negative. Unless this is done, the negative will not tally well with the vignetting-glass, and much difficulty in adjusting the latter will be experienced.

And now for some few hints as to the practice of paper printing generally. The common error incidental to beginners in this branch of photography is the idea that it is wholly comprised by a few purely mechanical operations. In some cases, it is true, the process of printing does not seem capable of admitting the assistance of artistic treatment, but a very limited experience will show what a cramped view this is to take of the subject The only time when a printer can hardly help producing standard pictures is when he is working with negatives of the very highest order And even then improvement can almost always be wrought, if the printer really knows his work, in a hundred little ways, the effect of which may scarcely be missed if absent, but cannot when present fail to be appreciated To take a practical instance, let us consider the treatment of a standard portrait negative The every-day printer merely lays it in a frame and exposes, tones, and fixes as many pieces of paper as he deems necessary to convert into what he calls pictures, if they turn out well, it is no credit to him The due gradation of light and shade, the harmonious modelling of the features, are no witnesses to his judgment or taste All that is good in the picture comes from the negative, but there is no trace of improvement effected or ornament added during the time it has been in the printer's hands But give the negative into the charge of the man who knows his work, and is what he professes to be, an artist, and, little room though there be for improvement, he will fill it up If he can find nothing else, he will operate on the face. He will make nature's work more natural by making her almost paint as well as draw in monochrome A brunette's face, instead of "coming out" an expressionless grey, will be coaxed by toning into a suggestion of its real colour A fair-haired, white-clad figure will be watched with the minutest attention, so that it does not transgress by a minute's excess of exposure the light airiness which is its prominent charm. At the same time no feebleness from under-printing will be visible, but the whole picture will stand out rounded, harmonious, and natural to the eye, and toned down into a perfect study of black, or rather grey, and white In a word, the printer will do justice to the taker of the negative, and the two combined will do justice to their common model, Nature

In the case of printing from good negatives I have only been able to give examples; it is impossible, in such circumstances, to dole out instruction in cut-and-dried rules and stereotyped formulæ But it will readily be imagined that if improvement can be effected by judicious printing in pictures from good negatives, *à fortiori* the printer's power is proportionally widened when he has to deal with bad ones Let us take the case of a negative where the lights and shades are harshly contrasted. Taking the use of masks as a precedent, we shall find a layer of cotton-wool or tissue-paper, spread judiciously on the glass face of the negative, will bring down the density of a shade in a most satisfactory manner. A white face, which instinctively reminds one of a clean napkin with a few holes in it, can be wondrously improved by pasting over the glass side of the negative a piece of tissue-paper with a hole just over the ghostly features in question The face is thus printed slightly in advance of the rest of the picture, and begins to assume some show of expression In a like manner masks can be applied to any part which shows a disposition to print down into a deep unyielding black

I have already hinted at the advisability of printing weak negatives in the shade and strong ones in the sun The printer will sometimes find it beneficial to employ a slightly stronger sensitising bath than the ordinary one for paper that is to be used for prints from thin negatives, and, *vice versâ*, a weaker one in the case of negatives where great density is apparent

The question of toning, although it exercises a powerful influence for good or evil over the finished picture, must be left altogether to the good taste of the printer There are two extremes, however, which he should learn from the first to avoid The first of these is mealiness, that is, when a print looks as if it had been operated on with a scrubbing-brush and soft soap The other is harshness or crudity In this case the tone is hard and possesses no flexibility, the whole picture is a mass of rugged whites and blacks or browns "Whoever loves the golden mean" will produce no prints of this stamp, or at least, if he does, will hesitate to declare his incapacity by showing them

In some instances very pleasing effects can be obtained by using delicately tinted paper for the prints This can be procured of almost any dealer in albumenised papers, the most usual colours are pink and light mauve Their employment with thin negatives is often productive of good results Another method of giving a colour effect to a print is to dip it in a weak solution of some aniline dye, such as that manufactured by Judson. By immersion in a weak solution of blue dye, an effect something approaching moonlight may be obtained

Finally, let me advise the amateur silver printer never to rest satisfied with himself Let him always be ready to appreciate excellence in others, and to draw hints therefrom to adapt to his own practice. There is a lesson for the beginner to learn in every picture sent out by a really good photographer Let the former be proud to buy the productions of the latter, and to pick out and analyse each little dodge or cleverness which leads to some dainty effect, or adds another link in the chain of harmony which composes a real picture Let the portraits from some well-known gallery be examined for the sake of hints on suppression of harsh contrasts and perfect adaptation of tone Let the landscapes of some great photographic artist be made to show how careful printing can be superadded to careful lighting and manipulation of the negative Let the printer first perfect himself in obtaining creditable prints from standard negatives, and lastly complete his education by seeing how good a print a poor negative in his hands may be made to yield The latter is a crucial test which many who think themselves good printers would be at a loss to stand The greater credit therefore remains to him who can do so, and with it the consciousness that he is a master of his art, and, so far as is possible, is prepared to withstand any accident its practice may entail

CHAPTER XIII

ENAMELLING SILVER PRINTS.

IN Chapter XI it will be remembered that instruction was given concerning a species of glaze communicated to the surface of a print by means of a roller or rollers of steel, combined with powerful pressure This glaze was not very pronounced, it was rather of the nature of polish or of the burnish applied to metal I am now about to describe the process of applying to a print a glaze of a different nature, and produced in a different manner. My instructions will teach readers how to give their prints a brilliant and mirror like surface, not unlike that exhibited by enamel, hence "enamelling" is the name that has been given to the process by which this end is to be gained I must preface any practical intraction by a few remarks upon the use and abuse of enamelling With regard to the latter, the printer must reflect, before applying such a powerful addition to the effect of a picture as the mere fact of changing a "matt" surface into a most brilliantly glassy one implies, whether this addition is in every case a beneficial one Take, for instance, a perfect vignette where the whole charm of the picture lies in its tranquil softness, the effect of this is lost by turning it into an enamel But, on the other hand, there are many cases where the enamelled surface, one of the chief uses of which is to heighten the detail of a picture, adds a lustre and brilliancy to the minor surroundings of a print, which are instinctively seen to be wanting in an ordinary matt surface Again, it is a powerful argument in favour of enamelling, that the film of glaze undoubtedly affords decided protection to the print itself from the deteriorating influences of the outer air On the understanding, then, that enamelling prints, like most artificial additions to the normal condition of anything, has its good and its bad side, and that the printer must not hope to successfully invoke its aid without being fully prepared to exercise those well-worn attributes of the photographer, judgment and taste, we will proceed to the details of our process and their practical application.

The necessary apparatus and chemicals for enamelling are very simple.

The following is a full list of those required in the ordinary process, one or two extras may be needed in modifications or improvements, which will be mentioned and explained under their respective heads The first indispensable is a bottle of uniodised or enamel collodion It will be best for the young printer to buy this ready prepared, which he can do at any of the shops An ounce of gelatine will also be requisite That manufactured by Nelson is perfectly adapted to the purpose, and can be procured of any chemist The only piece of real apparatus needful is a "squeegee," which is a band of thick indiarubber set in a slip of wood, it costs from 2s 6d. to 4s Besides this, a certain quantity of glass plates of good quality and free from scratches will be needful to form a basis for the enamel film

I may mention before entering upon the details of my subject that the standard work on enamelling is that of M Piquepé, entitled "Enamelling and Retouching in Photography" The publishers are Messrs Piper and Carter, of Gough-square, Fleet-street, E.C, the price is half-a-crown On this work is based the present chapter The printer should also consult the able and practical paper on enamelling by Mr Henry Cooper, in the "Year Book of Photography for 1877," from which I have also derived many very valuable hints.

To begin work, as many glass plates as you require enamels must be carefully selected These should be cut of rather larger dimensions than the print itself, thus, for cartes de visite, quarter-plate glasses will be just the thing, for cabinets, half-plates, and so on With a little practice the printer will find that he can enamel two cartes on one half-plate glass, but he should begin by working them singly

The glass plates can now be coated with the enamel collodion and allowed to dry, this may take half an hour While the drying is going on, it is well to prepare the necessary solution of gelatine in the following manner Take as much gelatine as is likely, when dissolved in the proportion of one drachm to three ounces of water, to be sufficient for a given number of plates, and put it into a strong bottle with as much cold water as will just cover it In a short time the gelatine will become swelled If boiling water is added, the whole will rapidly dissolve and be ready for use

The dry collodionised plates must now be coated with the gelatine solution. If the latter is not clear, it can be filtered through fine muslin into another bottle. From this it can be poured, while warm, over the collodionised plate. This may not be found quite easy at first, but will become so after one or two trials, and a little of the solution spilt is a matter of very trivial importance.

The gelatine film, like the collodion one, must be left to dry, and may either be used directly it becomes so, or be reserved, by storing away the plates in an ordinary plate box, until further use This is very convenient, as any number of plates can be prepared at one time and be ready to hand at a moment's notice—perhaps several months hereafter

Supposing then an adequate number of collodio-gelatinised plates to have been prepared, let us proceed to the process of enamelling the prints, or, in other words, of transferring the gelatine pellicle to the face of the print The most simple method of accomplishing this is to take the plate in one hand, the untrimmed print in the other, plunge them both into clean cold water, bring the face of the print into contact with the gelatine film on the plate, and remove both print and plate simultaneously from the water Now pass the squeegee over the back of the print to exclude all air-bubbles and to render the contact perfect

Mr Cooper recommends the precaution of rendering the gelatine pellicle insoluble by immersing the dried gelatinised plate before transferring it with the print to the cold water, in a solution of chrome-alum, one grain to the ounce of water.

M Piquepé coats the plates a second time with gelatine, and, moreover, dips the print into a solution of gelatine before laying it over the face of the plate In this process the immersion into cold water is dispensed with M Piquepé avers that the greater number of gelatinous films the plate receives "the greater will be the depth, strength, brilliancy, and delicacy of the enamel." The cold-water transference, however, while perhaps not losing in efficacy, gains very much in ease and simplicity

A third plan, mentioned by Mr Cooper is not to coat the collodionised plates with gelatine, but to dip the print in the gelatine solution, and to lay it down on the mere collodion surface Contact is then rendered perfect as before with the squeegee.

When the print has been by any of the above methods caused by the pressure of the squeegee to adhere firmly to the collodio-gelatinised plate, it will be necessary to apply the card support to the back of the print. To accomplish this, take a card and cut it to a size smaller all round than the print. The card itself should be a thin one, and neither toned nor gilded Immerse it in hot water to soften it, and afterwards in a solution of gelatine in water (prepared in the manner described above), about two drachms of the former to every three ounces of the latter Lay the gelatinised card on the back of the print and apply the squeegee. The plate with the print and cardboard support can now be laid aside in some moderately warm room to dry

When the drying has been thoroughly concluded, which may take from eight to twenty-four hours (overdrying being impossible), the point of a penknife may be run round the print, which can then be detached from the glass, bringing away the collodio-gelatine pellicle along with it. The print will thus exhibit a brilliant enamel-like surface, which, as observed before, will not only heighten in a material degree the details of the picture, but will be highly conducive to its permanence

When the enamelled cards have reached this stage, they may be simply trimmed round, and in one sense considered finished But as M Piqupée says, the work in this state, owing to the probable dirtiness of the backs of the cards, and the fact that as the print is enamelled all over it cannot be handled with impunity, hardly presents a sufficiently neat appearance And so the following method of operation recommends itself as productive of more satisfactory and artistic results In the first place it is necessary to trim the enamelled cards to the size of an ordinary print This is best done by laying the cutting shape upon the card, adjusting it to a correct position, holding the card and shape between the thumb and fingers of the left hand, and cutting round the card with a pair of scissors in the right Some strong mounting cards of double thickness should now be procured, and the enamels, after receiving a coating of hot glue, can be applied to them When a piece of tissue paper has been pasted at one end of the mount so as to overlap and protect the face of the enamel, the operations connected with the production of the latter are complete

If it be desired to emboss an enamel, this should be done before mounting The enamel card is passed through the press, a piece of paper laid in the centre of the mount to keep up the relief, and only the edges of the enamel card treated with the glue.

In some cases it is requisite to "spot out" the prints before enamelling Owing to the subsequent immersion, &c, of the print, it is obviously impossible to employ Indian ink or the ordinary pigments which are soluble in water The following method of procuring an insoluble pigment is that employed by Mr Henry Cooper, and described by him in the article referred to previously Mr Cooper's own words are so practical and so straightforwardly clear that I should wrong them and him by attempting to torture them into mine · "The plan," he says, "is based upon the well-known fact that gelatine in the presence of a minute quantity of chrome alum becomes quite insoluble in even hot water.

"I make two solutions :

No 1.	Chrome alum .. .	10grs
	Water	10oz
No 2.	Nelson's gelatine	½oz
	Carbolic acid. .	10 drops
	Alcohol .	½oz.
	Water . . .	6oz

"When about to touch some prints, solution No. 2 is warmed, and a small quantity is mixed with the pigment on the palette, which must be kept gently warm. A little of the alum solution is now added, and with this mixture the prints are worked up as much as may be required To prevent the gelatinising of the pigment at the point of the brush, the print must be kept slightly warm, which is easily managed by laying it down on a thick sheet of glass previously heated, or in many other ways which will readily suggest themselves After a little practice no more difficulty will be found in working with this gelatinous mixture than with ordinary water-colour paint, and when once dry every touch will be immovable by washing either in hot or cold water

"One or two little details are of some importance The first is that the mixture of gelatine, pigment, and alum must on no account be allowed to set or dry whilst in use, as, once dry, it is insoluble, and, once set to a jelly, it is not liquefied again by heat The second is that the same precaution must be taken with the brush used I find the best plan is to use a palette of the saucer or watch glass form, and to stand it in a vessel of warm water, and always to use hot water for diluting the paint and rinsing the brush"

Instead of the pigment, in combination with solution No 2, Mr Cooper remarks that a small fragment of Autotype tissue can be employed as a convenient substitute What Autotype or carbon tissue is will be explained farther on As regards the practical adaptation of Mr Cooper's remark to enamelling, "the bit of tissue is soaked in cold water for a few minutes, and then placed in the little saucer palette, and heat applied, when the coating (consisting of pigment, gelatine, sugar, &c) will melt and the alum solution can be added."

The following is a simple method, recommended some little time ago in the "Photographic News," by Mr Henry Knight, of enamelling prints with ordinary negative collodion Make up the following

WAX SOLUTION

White wax	10gr
Methylated ether . ..	1oz

Cut the wax up fine, and after the addition of the ether, shake until solution takes place The solution will be milky, but does not require filtering Pour a few drops of it on to a glass plate and rub bright with a chamois leather Coat with ordinary negative collodion, and when the film is set hard (which will be in about five minutes), immerse or wash it under a tap until the greasiness has disappeared It is then allowed to dry spontaneously, or by the aid of heat A solution is now made in the ordinary way of gelatine, thirty grains to the ounce of water, which, after straining through fine muslin, is poured while warm over the dried collodionised plate If the solution does not flow evenly, it can be guided over the surface of the glass with a camel's hair brush or a strip of paper. The plate is rested on a level surface until the gelatine is set (i.e., in about ten minutes' time), and then plunged, as in the ordinary enamelling process, along with the print, into a dish of cold water. The face of the print, is brought, while under water, into contact with the gelatinous film, and on their simultaneous withdrawal from the water, the palm of the hand, or, better, the squegee, is applied to insure the perfect contact. This done, it is treated as if it were an ordinary enamel produced with special enamel collodion.

CHAPTER XIV.

COLLODIO-CHLORIDE OF SILVER—PLAIN SALTED PAPER—FERRO-PRUSSIATE PAPER.

HAVING described at some length the process of printing in silver on albumenized paper, I will now proceed to discuss other methods of printing, in which the application of a substratum of albumen to the paper ceases to be a necessity. Foremost amongst these comes the process of printing with Collodio-chloride of silver, which was introduced to the photographic public about seven years ago, by Mr G. Wharton Simpson, the editor of the *Photographic News* The following formulæ and method of operation are taken from the account of the process, as published by the inventor himself and described in the *Year Book of Photography* for 1871, and in the American publication, *The Silver Sunbeam*, published by Messrs Anthony and Co., of New York, and Messrs Trübner and Co., of 59, Ludgate Hill, London, E C. The first requisite in the process of producing the collodio-chloride, or, rather, of impregnating a certain quantity of collodion with chloride of silver, is the collodion itself. This must be *plain*, and can either be purchased or made up in a stock solution, according to the following formula —

PLAIN COLLODION.

Alcohol	5oz
Ether	5oz
Pyroxyline (gun-cotton)	60grs.

Shake the mixture until the gun cotton is dissolved, and set aside for a few days to settle. The clear collodion can then be decanted off into another bottle for use Now prepare three further solutions as below —

No 1. NITRATE OF SILVER SOLUTION.

Nitrate of silver	1dr.
Distilled water.	1dr.

No 2. CHLORIDE OF STRONTIUM SOLUTION

Chloride of strontium	64gr.
Alcohol	2oz.

No. 3. CITRIC ACID SOLUTION.

Citric acid	64gr
Alcohol	2oz.

Thirty drops of No. 1 solution are now mixed with one drachm of alcohol, and added to every 2oz of collodion required to be converted into collodio-chloride. Next 1dr. of No. 2 solution is poured in gradually, accompanied by constant agitation; lastly, half a drachm of No. 3 is added, and in a quarter of an hour the whole is fit for use.

The paper to which the collodio-chloride is to be applied must be well sized in order to prevent the absorbence into its fibres of the coating solution. A sizing of gum tragacanth is recommended by Mr. Wharton Simpson.

Before coating, the paper, which should be cut in sizes rather larger all round than the cutting-shape, must be made into a kind of little tray, in order to facilitate the application of the collodio-chloride solution. This is done by turning up the edges all round for an eighth of an inch, and leaving a corner from which to pour away the refuse solution. The paper is then attached by pins at the corners to a flat board, and coated just as an ordinary glass plate is coated with ordinary collodion. When thoroughly dried it may be brought into contact with the negative in an ordinary printing frame.

When the printing, which should be carried rather farther than with albumenized paper, is accomplished, the print can be removed from the frame, subjected to a slight washing, and immersed in a toning solution such as the one for which the first formula was given in Chap. XI. An old and weakened sample of this gives preferable results to a newly-mixed one. When toned, the print may be fixed in a hypo bath as follows:

FIXING BATH.

Hyposulphite of soda ..	3oz
Water .. .	20oz (1 pint).

After an immersion of five or six minutes in this solution, the print can be finally subjected to a stream of water from the tap for the same duration of time, and then needs but drying and trimming to complete the process of its production.

Apart from its power of giving brilliant prints upon paper, collodio-chloride of silver is often used for producing in a similar manner prints upon glass. The kind of glass usually employed is *opal*, and has the appearance of fine white porcelain. The process of producing prints upon this surface is called *opalotype*, and gives very beautiful results. An edging of dilute albumen is run with a brush all round the ground side of the plate, and when this is dry the plate is coated exactly as if with collodion, with the collodio-chloride of silver. This film is in turn dried before a bright fire, and subsequently allowed to cool. It is then ready for transference to the printing-frame.

The printing-frames employed in opalotype are generally of a different kind from those used in ordinary printing. The reason for this is that in the latter the progress of the print cannot (unless indeed the simple method proposed by Captain Abney, of connecting negative and sensitised plate by a strip of paper pasted along the corresponding edges of both, is adopted) be satisfactorily watched. The special frames for opalotype are very ingenious and convenient. Cox, of 26, Ludgate Hill, sells one of quarter-plate size for 7s.

The operations of toning, fixing, &c., an opal plate sensitised with collodio-chloride of silver are conducted in the same manner as in the case of a print in the same sensitive material on paper.

To those who are unable or unwilling to prepare the collodio-chloride for themselves, it may be gratifying to know that they can purchase it ready prepared of any photographic chemist, at the rate of about 10oz. for 5s.

Besides collodio-chloride of silver there are other methods of printing in which the albumen substratum is dispensed with. Amongst these is the process of printing upon plain salted paper, which is prepared as follows. A salting solution is made up according to the proportions given below:—

SALTING SOLUTION.

Chloride of ammonium	100gr
Gelatine	10gr
Water	10oz

The gelatine is allowed to swell in cold water, which is poured off. The water prescribed in the formula is now heated and the swollen gelatine dissolved in it. After filtration it is poured into a tray, and the paper required to be salted floated upon its surface for about three minutes. It is a good plan to use for the purpose the *wrong* side of ordinary albumenised paper.

Positive ferro-prussiate paper for copying drawings, maps, plans, &c., can be procured of Marion and Co., 22, Soho-square. It is sold in rolls measuring a little more than 2ft wide by nearly 11 yards long, at 10s. per roll. It simply requires exposure in the frame under the drawing or other object which it is desired to copy, and washing in cold water. It shows the copy in white lines on a blue ground. Ferro-prussiate paper is also sold by the Sciopticon Company, 157A, Great Portland-street, W., who advertise a manual on the subject.

I shall not enter at present into "printing by development," as it is not very extensively practised in ordinary printing from negatives, and will come in more *àpropos* of a subject, the discussion of which must necessarily be postponed. Readers will find it under the head of "Enlarging Processes."

CHAPTER XV.

CLOUDS IN LANDSCAPES

FEW who have indulged in the most fleeting glimpse at the contents of a picture gallery have failed to recognise the prominence given by the artist in almost every landscape to the representation of the sky None gifted with the most ordinary powers of observation can deny the effect of *natural* clouds upon the most humble picture and yet in the face of these facts it is only of late that photography, which in almost every other sense may be fairly looked upon as Nature's most faithful pencil, has attempted anything more than skies composed of an expanse of glaring white To an outsider this seemed ridiculous "If you reproduce objects of view on the land, why can't you do the same for those in the sky?" seemed a highly reasonable question The photographer rejoins that he can, and now does reproduce clouds by his art, but that in many cases he finds it impossible to reproduce them simultaneously with objects on the land A simple explanation will set this right If you direct a camera and lens towards a group of fleecy clouds, and expose a sensitive wet plate for a minute or more, the result will be one mass of uniform shade in the negative, which will produce in the print nothing In other words, you will obtain a sky (?) the exact counterpart of those glaring unprinted portions of the paper which a few years ago ruined the effect of almost every landscape photograph You are quite ready with the obvious reason for this the plate, you say, was exposed far too long for the highly actinic colour of the clouds, and the detail of the latter was merged by the over-exposure into uniformity A result precisely analogous to this is obtained by leaving a thin negative superposed upon a piece of sensitised paper, exposed to actinic light for a lengthened period. The thin negative corresponds to the delicate actinic tracery of the clouds, the sensitised paper to the sensitive plate. In either case the result is unnatural uniformity of tone. To continue your investigation, lower your camera a little so as to include in your picture some part of the landscape proper, such as a clump of trees, for instance, which, as I have explained elsewhere, have an essentially *non*-actinic colour With a minute's exposure your sky will come out in the negative exactly as before—uniformly black—but your trees will probably be full of the minutest detail, showing, as far as they are concerned, a correctly timed exposure Finally, direct your camera once more to the clouds alone, and expose almost instantaneously By this you will doubtless secure a delightful piece of sky (or "cloud-negative," as you will, when you have learnt its use, prefer to call it), full of airy softness, yet with the same fulness and roundness which correct exposure and good lighting give to more ordinary and substantial objects. With the lesson which the production of these three negatives have taught you, you are now thoroughly competent to grapple with the subject of clouds in photographic landscapes In a word, you have found the colour of clouds is so highly actinic that, photographically speaking, it is unmanageably in advance of almost all the rest of the picture, hence that the simultaneous production of the two by the every day appliances of photography is at present unattainable. As, however, the presence of clouds in the majority of landscapes is, from an artistic point of view, a *sine quâ non*, the photographer must learn to produce them, if not in conjunction with the original negative, by the aid of supplementary contrivances, the nature of which I will explain.

Let us suppose, then, for the sake of convenient reference, that we have before us a landscape negative, perfect in all respects, with the exception of its so-called sky. It is into this sky we are desirous of infusing a little of that fulness and variety which we admire in natural skies and even in those of good drawings, but which are in our negatives conspicuous only by their absence.

The first on the list of cloud-making processes is one which does not require very lengthy mention, as, so far as its principle goes, it is commendably simple. In one word, its object is to produce clouds that are essentially artificial. Whether they are artistic depends entirely upon the talent of the operator. The process consists in putting the clouds into the negative by hand. To admit of this the original sky in the negative should not be completely opaque, otherwise no alteration, except that effected by the reduction of its intensity in different parts, would affect the sky of the print The sky should, on the contrary, be of a modified opacity, producing rather slight shade than otherwise. It is obvious that if a dab of really non-actinic colour be applied to the middle of such a sky as this, the result, in the print, would be a rough imitation of the sun in the midst of a thunderstorm. Without attempting such an ambitious effect at present, it will be seen that an artist has it in his power to convert this crude dab of white into a beautifully fleecy bank of clouds in the midst of a sky a shade darker in tone than themselves. And so, with a brush, charged with non-actinic colour, he roughly sketches out those portions which he wishes to be absolutely white, and softens down the edges with colour, the non-actinic properties of which are not so powerful. Wherever he wishes the sky in the print to be a trifle shaded he leaves the original sky of the negative untouched. What retouching he does give, is given to the glass side of the negative for obvious reasons The operation requires considerable artistic skill to produce really satisfactory and natural results, but has the advantage of being conclusive—once done it is done for ever, and with one printing the landscape is complete, with its clouds more or less successfully adding to its general effect

We now come to processes where the clouds are inserted into the landscape by what is known as double-printing For this the chief requisite is a cloud-negative such as that mentioned above The photographer can either make this himself or purchase it ready made The cloud-negatives with perhaps the greatest reputation in the market are prepared by Sergeant W Perry, of Hythe, Kent The operation of printing-in a sky with a cloud-negative is very simple The original landscape is printed in the ordinary way, with its sky uniformly white, or nearly so The print is then taken from the frame and laid upon a level surface, such as a piece of glass. A cloud negative of a character suitable to the landscape is selected, and laid on the face of the print in such a manner that the clouds are properly disposed over the amount of sky at the printer's disposal Mr. Perry's cloud-negatives are not on glass but on fine textureless transparent paper, and thus will require the superposition of a glass plate to keep them and the print in proper contact The outline of the landscape can now be roughly masked out with a handkerchief or duster, so as to allow only the sky to be exposed to the light The support, the print, and the cloud-negative with the mask are now taken out into direct sunlight for perhaps twenty seconds On removing the cloud-negative it will be seen that the clouds have been printed-in on the original landscape in the most effective, and, if the cloud-negative has been suitably selected, in the most natural manner. The chief drawback to this process is the fact that each print requires a separate clouding; but the results in the hands of a skilful and artistic operator are such as will well justify the slight amount of extra trouble spent in their production.

Another plan of operation in working with a cloud-negative is that proposed by Mr. R. V. Harman. This gentleman describes in the *British*

Photographic Journal Almanac his mode of procedure in the following words "Having adjusted the print to the most suitable portion of the cloud-negative by holding them up to the light, I hold both negative and print in my left hand, thumb on the negative, and fingers extending over the back of the print. With a camel's hair brush charged with dilute moist colour I roughly trace the outline of the landscape on the negative, and place the same with the print attached in a pressure frame with plate glass, a size larger than the negative itself Having fixed the back of the frame, turn it up, and the water colour line will be distinctly seen through the plate glass Now lay a sheet of glass over the face of the frame, sufficiently large to rest on the woodwork, and on this arrange a cloth or duster so as just to cover the water colour line, taking care, at the same time, to cover the landscape portion of the print The frame may now be put out to print in the usual way, and can be looked at as often as necessary while printing, and the cloth instantly readjusted without the least trouble . By breathing on the glass the water colour line can be instantly wiped off and another substituted for a different subject The frame must, of course, lie in a horizontal position during printing, and may be placed in any light, either feeble or strong, *but not in the sun*"

It is advisable, when using a cloth or a duster as a mask in cloud printing, to move it slightly during the exposure of the negative, as otherwise a sharp line will frequently separate the landscape from the clouded sky.

A final method of obtaining clouds for landscapes is, when taking the original negatives for the latter, to take second negatives for the former from exactly the same point of view It is very little extra trouble, after securing a landscape the natural sky of which is really its prominent feature, to rapidly expose another plate for the clouds To make use of this of course double-printing will have to be resorted to A cloud-negative obtained by these means is obviously more easy to work with, and, above all, productive of far more natural results than, nine times out of ten, accrue to one whose affinity with the landscape in question is only determined by the number of cloud-subjects at the printer's disposal, and his artistic taste in making a selection

Talking of artistic taste in reference to clouds, it is curious to note how limited popular ideas on this subject only too frequently are. Beginners cannot be too strongly warned against decorating their skies with abnormal ornaments which are no more in keeping with the subject of their picture than dabs of black paint on the features of an Englishman. What can be more absurd than a landscape basking in a delicious glow of sunlight and surmounted with heavy banks of lowering thunder clouds? And yet this is a mild type of the errors into which the cloud-printer who has not his brains as well as his fingers in his work is liable to fall White skies are unnatural enough, but they can hardly be worse than unnaturally clouded ones Without, however, going further into the subject of the artistic treatment of clouds, I should like to offer a practical hint which may prove useful to the beginner Cloud-negatives to an unpractised eye are very deceptive objects, and frequently it is very hard to determine the manner in which the clouds will "come out" Hereby the hasty tyro is led to make an equally hasty choice, and the result is one of the inartistic combinations mentioned above This is completely obviated by pulling prints from each cloud negative at one's disposal These toned and fixed often form a far more satisfactory and reliable criterion of the qualifications of a cloud-negative than the negative itself

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CHAPTER XVI

APPENDIX TO THE WET COLLODION PROCESS

IN the production of a work like the present there are two points of especial importance which not only require to be carefully considered but also to be considered simultaneously The first of these, of course, is the amount of information conveyed, the second is the manner in which the conveyance is accomplished Scanty information, however well arranged, is of scanty use, but copious information, combined with ill-arrangement, is downright injury In the case of "Practical Photography" information has been forthcoming in plenty, but the projection of it into a form at once readable and affording convenient reference has not been attempted without some trouble and care The outlines of the plan which we have adopted are as follows In the first place, it seemed advisable to divide the work into, say, three separate parts The first of these was to comprise the Wet Collodion process, together with that of printing in silver These two processes include the operations requisite in producing the ordinary pictures which we meet with in albums and elsewhere The second part contains full instructions for producing negatives from dried films, and the preparation of the latter—processes which may be grouped under the collective designation of "Dry Plate Photography" The contents of the third part are a little diversified, as will be seen. To return to Part I., it will be observed on glancing back at the foregoing fifteen chapters that its object is now virtually fulfilled. There are, however, some points of interest which have been as yet passed by These were, for the most part, represented by operations, the description of which, while affecting the continuity of the current work, could not with any honesty be stretched out to form even the short chapters into which, for the sake of speedy reference, our subject-matter has been advisedly divided. And so it has been resolved to group these items into an Appendix, not necessarily of great length, but sufficiently comprehensive as not to lose sight of any omission or rather postpone-ment hitherto made in carrying out our plan of giving an exhaustive account of Practical Photography To introduce the various items of information no preface will be needed beyond the few words already written and the headings of the respective paragraphs

Interiors —Most beginners in photography are anxious to try their hand at interiors, and are not unfrequently disgusted to find their efforts unattended with success The truth is that the reproduction of interiors, as a rule, requires not only care but practice in that particular branch The beginner may profit by learning that the collodion used should be a sample which has been iodised some little time and has acquired a dark tinge of yellow When the plate has been transferred to the dark slide it should be backed with damp blotting paper, and allowed to drain upon a strip of the same material The chief point in photographing interiors is the exposure, which should by no means be hurried. Two or three hours are frequently necessary to produce an adequate representation of a shady room The light in an interior, too, is often troublesome A window through which the sun has been pouring during the exposure of the plate will come out a mass of blurred white This blurring or halation can sometimes be prevented by screening the window or source of light until the exposure is nearly completed

Copying —In copying by the wet process, as in photographing interiors, a ripe collodion should be employed An important feature in successful copying is the lens Portrait lenses stopped down, so as to render the margin of equally sharp definition with the centre of the picture, answer fairly well, but the finest copying lenses are the doublet symmetricals and rectilinears of Ross and Dallmeyer respectively. Single lenses should not be used systematically for copying, as they give highly distorted marginal lines, and so destroy effect. Copying should be carried on in bright light, and the lens should be pointed straight to the centre of the subject to be reproduced. Pictures behind glass should by reason of the reflecting surface of the latter be removed from their frames. For myself I greatly prefer taking copies and photographing interiors with dry plates prepared by any standard method, to employing wet collodion for these particular purposes.

Ferrotypes —Amongst the variations of the wet process, the taking of ferrotypes holds a conspicuous and not unpopular position. A ferrotype, as the name implies, is a picture upon a thin plate of iron, which takes the place of glass as a support for the collodion film. These plates can be procured of two qualities, "egg-shell" and "glossy," from (among others) J. Fallowfield, 36, Lower Marsh, Lambeth, S.E. That dealer also supplies ferrotype collodion (as approved by Mr Estabrooke, the great American ferrotyper), ferrotype varnish, envelopes, mats, &c. I give from his catalogue the formulæ for ferrotype pictures as used by American photographers.

Sensitising Bath

Recrystallised nitrate of silver	2oz
Distilled water	20oz

Mix, and then add 1dr of the ferro-collodion, shake and filter, and add two or three drops of nitric acid. The bath should be nearly neutral. If the shadows are muddy, add a little more acid.

Developing Solution

Protosulphate of iron	1oz
Water	20oz
Glacial acetic acid	1oz
Alcohol	1oz

Filter, and it is ready for use. For fixing cyanide of potassium is preferred. If in taking ferrotypes it be desired to avoid the yellow tinge, which that class of pictures are apt to exhibit, a course recommended is, after development, to flow the plate thoroughly with a strong solution of *gallic acid*, and to wash well again before fixation. To take a medallion ferrotype, a sheet of white cardboard, with an oval opening in the centre, is placed upon an easel and interposed between the camera and sitter. The background should be dark. Pictures thus produced are especially suitable for embossing. Vignettes are secured in the same manner, with the exception that the opening in the cardboard should be serrated (*i.e.*, toothed like a saw), and that the latter, during exposure, should be quite out of focus. A neat way of preserving ferrotypes is to slip each picture into a specially designed "envelope" with dome or arch opening, and a flap to protect the portrait from injury.

Albumenising Glasses.—Many good photographers make a practice before coating a plate with collodion of giving it a prior substratum with a solution of albumen. This last is prepared according to the following formula :

Albuminising Solution

White of one egg.	
Water ...	20oz
Ammonia ..	6dr.

Beat up the white of egg (having separated the yolk) into a froth, and allow to settle for a few hours, add the water, shake well, and finally add the ammonia prescribed above. This solution after being kept a few days may be filtered and used forthwith. While pouring it on to the plate care must be taken to avoid air bubbles on the film, and the solution must not be allowed to flow over the edges or the back of the glass If attention is not paid to this latter item, the superfluous albumen will contaminate the sensitising bath After coating, the albumenised plates can be allowed to dry away from the dust and stored for future use A more convenient method than pouring is to apply the albumen with what is known, from its inventor's name, as the Blanchard brush This is made in the following manner A strip of glass is procured about 6in long, and 2in broad, also a strip of swansdown calico the same width as the glass, but only 4in long The latter is folded in the middle and bound at its ends to one end of the strip of glass, leaving, as it were, a broad loop of the swansdown calico about 1in long This forms a wide brush (not unlike, except for its being formed of a fold, the brushes employed for damping copying tissue) to be dipped in the albumen solution, the excess of which should be squeezed out against the edges of the vessel in which it is contained. The surface of the plate can then be brushed up and down, and a smooth layer of albumen easily imparted to it The glass plate should be chemically clean, and may be coated either in a dry state or, perhaps preferably—especially when pouring is resorted to—after being moistened with pure water After pouring on like collodion, the surplus solution should be returned, not to the pouring but the stock bottle This prevents both the accumulation of dust in the pouring bottle and the formation of air bubbles in subsequent coatings The great advantages of albumenising plates are that it forms an effective cure for splitting and slipping films, and that it has the merit, when a plate has once been made clean, of keeping it so for many months I may as well mention here that the white of egg in all photographic operations may be replaced by dried albumen, to be procured of most photographic chemists, 1oz of that prepared by R W Thomas, of 10, Pall-mall, is equal to the whites of seven eggs To make liquid albumen of the natural strength 70gr. of the dried substance are dissolved in 1oz of water and strained through fine cambric

Developers —Besides the common developer, the formula for which was given in the latter part of Chap II, there are various others, the employment of which is attended with successful results The double sulphate of iron and ammonia is noticeable for its power of keeping without deterioration A standard formula for a stock solution is as follows

AMMONIO-SULPHATE OF IRON DEVELOPER.

Ammonio-sulphate of iron	1½oz.
Glacial acetic acid	1oz
Spirits of wine	½oz.
Water	.. 20oz.

It is sometimes satisfactory to add organic substances, such as sugar or gelatine to the developing solutions, in order to procure additional density Here are two formulæ for

ORGANIFIED DEVELOPERS.

(1) *Saccharō-sulphate of Iron.*

Protosulphate of iron	8dr
Lump sugar	1dr.
Glacial acetic acid	1dr.
Spirits of wine	1dr
Water	8oz

(2) *Gelatine Sulphate of Iron.*

Protosulphate of iron	3dr.
Glacial acetic acid	1½dr.
Gelatine	8gr
Spirits of wine	1dr
Water	8oz.

The presence of organic substances, such as the above, acts as a restrainer and keeps away fog If gelatine be used, the exposure should be slightly longer than usual Talking of restrainers, the well-known *Collocine* of Mr. Carey Lea must not by any means be passed over. This preparation possesses great restraining power and the additional valuable property of reducing the exposure to a considerable extent It is prepared commercially by Wratten and Wainwright, of 36, Great Queen-street, W.C., at the rate of 2oz for 1s Only a drop or two need be used at a time.

Intensifiers —Instead of "acid pyro," in combination with a solution of nitrate of silver solution, the following formula, recommended by Mr Valentine Blanchard, has been adopted by many photographers

IRON INTENSIFIER.

Protosulphate of iron	1dr
Citric acid	2dr
Water	10oz

This, of course, must be mixed, like "acid pyro," with a solution of silver nitrate The same strength of the latter is applicable to both pyro and iron. A prominent feature in this intensifier are its keeping qualities. It works better after the lapse of a month or two than when freshly prepared.

Stereoscopic Pictures.—A stereoscopic picture is a representation of an object from two slightly different points of view. There are few to whom the drawing room stereoscope with its accompaniment of photographic pictures is not familiar; but it must be said at the same time that about these scientific toys, as folks are wont to call them, there is existing a great amount of needless miscomprehension. To begin with, let us take one of these stereoscopic pictures and examine it. We shall find, as I said before, that it is a representation of some scene or object from two slightly different points of view. We put the slide, as a mounted stereo is sometimes called, into the stereoscope, and a curious metamorphosis in its appearance at once takes place Instead of two pictures we see but one, and that one is distinguished by a marvellous fulness and relief which strikingly represents the manner in which we view natural objects with our own eyes It is not my intention to go further into the scientific principles on which the effects of stereoscopicity are based, as there are various scientific works in which the subject is discussed far more fully and more satisfactorily than I could hope to discuss it in a manual of practical instruction. But as stereoscopic pictures undoubtedly constitute an important branch of photography, it will be necessary to give an account of the very simple ways and means connected with their production In the first place, it is obvious that, to avoid inconvenience, if not pseudo-scopicity, the two pictures comprising the stereogram should be taken almost, if not quite, simultaneously This result can be achieved in either one of two ways The first is to employ a camera mounted upon a lath or bar of wood, upon which it slides from right to left. The bar or lath is screwed on to the tripod, and the camera stationed at the right end. A picture is now taken with the apparatus in its present position, after which the camera is slid to the other end of the lath, and the other component of the stereogram secured. In mounting the prints from the negatives obtained in this apparatus great care should be taken to preserve the proper position of the two pictures. If they are taken from two separate negatives it is necessary to *transpose* the latter, then to cement the two corresponding sides together, and finally to bind them by a strip of paper round the edges to a single plate of glass of a size equal to that of the two negatives If cut out masks, preferably of dome or cushion shape, are accurately pasted on to the two negatives so as to allow of no interstice through which the light may penetrate to the sensitised paper, the stereogram can be secured at a single printing. Another plan in working with a lath stereoscopic camera is to have a dark slide capable of taking the whole stereogram on one plate and arranged so as to bring successively both halves of the latter behind the lens. This is adjusted so as to obviate the necessity of transposition and subsequent cementing and binding to another plate. The great defect of the lath camera is its inability to secure negatives of moving objects, which are peculiarly fitted for subsequent scrutiny with the help of the stereoscope. Thus, for general use, it is recommended to produce stereos with what is called a twin lens or binocular camera. This instrument, as its name implies, has two lenses fixed on its front, by which the two pictures are taken simultaneously. In Chapter IX I recommended my readers to procure such a camera for general use, as by removing the partition employed in taking a stereogram, in order to prevent the light from one lens affecting the half of the plate on which that from the other is intended to act, the camera can be used for taking single pictures on the full size of the plate. In working stereos with a binocular camera the two pictures must be transposed on the mounting card—that is, the print from the stereographic negative must be cut in half, and the original right-hand picture pasted on the left hand of the card Another course to adopt is to cut the negative in half and transpose the halves, as in working with two separate negatives in the lath camera With regard to the lenses specially applicable to stereoscopic photography, I may mention Dallmeyer's "New Stereoscopic," "Patent Stereographic," and "Quick-acting Stereoscopic" lenses, together with Ross's "Instantaneous Stereographic," as exhibiting the highest possible type of excellence in this peculiar branch. All these lenses are applicable to portraiture, and can be used for simple landscapes of half-plate size by unscrewing and dispensing with the back, and then replacing it by the front combination A pair of rapid rectilinears or symmetricals also answer admirably for stereoscopic work. It may be added in connection with stereoscopic photography, that an even finer effect than that exhibited by the ordinary paper "slides" is to be obtained by producing the stereogram in the form of a transparency, instructions for preparing which will be found further on

The Dark Room Window—The question of a convenient and at the same time effective means of providing a non-actinic light for the dark room is one so important to the beginner, and, for the matter of that, to the proficient, that perhaps a few words beyond those already given in the body of this work will be acceptable. Of late, two preparations connected with non-actinic light have been started, both of which promise to be widely popular The first is in the form of a varnish called *Chrysoïdine*, which is said to be used with great success in cutting off the actinic rays. The second is a species of muslin, prepared, I believe, with this very varnish, or with a dye containing an identical colouring matter The chrysoidine varnish can be obtained from, amongst others, Messrs Mawson and Swan, Newcastle-upon-Tyne. The non-actinic muslin is manufactured and sold by J Solomon, of 22, Red Lion-square. The colour of the latter is a most beautiful orange, and two thicknesses of it are sufficient to cut off the effects of the most powerful actinic light from the most sensitive plate. A few feet of this material hastily tacked round the sash of a window of moderate size at once converts even a bed chamber into a dark room, quite impenetrable by a direct sunlight The muslin is rather expensive, being 7s. per yard of 32in width, but when its utility is considered, the price can hardly be cried out against A third method of non actinically lighting the dark room I clip from a letter to the *Photographic News* in which this recipe is given —"Get the following tubes of oil colours from an artists' colourman burnt sienna, raw sienna, megilp. Mix the three together in equal proportions with a palette knife, and with a soft hog's hair brush paint both sides of the window When dry a second coat may be given on the outside if needed Chrome yellow is useless, for not only is it too granular and opaque, but it has a tendency to bleach A window 3ft or 4ft square can be painted for 2s, the tubes costing 4d each For dark tents a single piece of yellow cloth painted on one or both sides makes a capital window" The author of the above recipe has used a window prepared according to it for ten years, and states that in the light produced by it, even though the window be a yard square, the most sensitive plate can be developed without fear of fogging As a basis for the non-actinic pigment no coloured or flashed glass is needed, ordinary sheet glass, such as is commonly used for window panes, being sufficient For those who are not fortunate enough to secure a dark room with a window, and who are thus precluded from turning the daylight to account, it will be necessary to employ a lamp or candle with some kind of non-actinic shade Various methods of manufacturing such shades will readily suggest themselves to the ingenious student, but I will briefly notice two which are not within the limits of home resources The first of those is the candle reflector, which is constructed for adjustment on a candle, and which reflects the flame very strongly on to any desired spot. A piece of orange paper or cloth tied over the open face of the reflector at once gives a most satisfactory light, than which hardly anything better can be desired Other ingenious contrivances have been lately introduced in the shape of globes and chimneys for lamps or gas of ruby glass The utility of these is too obvious to need explanation

Stains from Photographic Chemicals —There are several methods of obviating or removing the highly unpleasant stains arising from the employment of certain of the chemicals used in photography One method, following the rule, that "prevention is better than cure," is to sheath the hands in gloves of soft indiarubber, which can be procured at the various establishments devoted to the manufacture of that material There are also several courses which can be adopted for removing the stains which have actually appeared. Cyanide of potassium is effective, but too dangerous for general use The following is an excellent and harmless recipe —"Put ¼lb. glauber salts, ¼lb chloride of lime (the sanitary disinfectant), and 8oz of water into a small wide-mouthed bottle, and when required for use pour some of the thick sediment into a saucer, and rub it well over the hands with pumice-stone or a nail brush, and it will clean the hands quite equal to cyanide, but without any danger This will do to use over again until exhausted, and should be kept corked up" The disagreeable smell arising from the use of this mixture may, it is said, be entirely avoided by the liberal application of lemon juice, which not only removes the smell, but whitens the hands F S. Cleaver, the well-known soap manufacturer, makes a "photographic soap," specially prepared for the removal of photographic stains

Photographic Varnish Making —Although amateur varnish making is by no means to be recommended as a general thing, there are occasions when the ability to perform it are decidedly convenient For this reason I give the following recipe by Mr Nelson Cherrill, a well-known and practical photographer, for making up a simple and good varnish, in quantity sufficient to last an amateur many a long year There is no object whatever in preparing varnish in small quantities Mr Cherrill's own words are as follow "Take three-quarters of a pound of gum sandarach and 2oz of gum shellac (the brown I used), and place them in a bottle, and cover them with very strong alcohol Stir up frequently, and keep in a warm place, in about two days pour off the liquor into a Winchester bottle, and put again some more strong alcohol, let it digest two or three days longer, stirring often, and keeping the bottle in a warm place This will dissolve all the residue Add the liquor to that already in the Winchester, pour in an ounce of castor oil, and shake it well up Now dilute the whole with common methylated spirit till the Winchester is full, and, after fining, which will happen in a week by itself, you will have as good a sample of varnish as anyone need want. The point in this preparation is that the pure alcohol, being used as a solvent, only seems to take up all the good properties of the gums, and, when the dilution comes, all the gum is still held in solution, whereas, in my hands at least, any attempt to dissolve the gums direct in the methylated spirit is a failure, as far as the quality of the varnish is concerned. This varnish will dry half bright, and will take the pencil very readily, if it be wanted to add to the tooth The surface will rub with perfect ease by the finger being just touched with powdered pumice or resin," &c

With the above few hints I conclude the first part of "Practical Photography."

PART III.

PHOTOGRAPHIC MISCELLANEA.

CHAPTER I

INTRODUCTORY

THE present chapter, the first of the Third Part of "Practical Photography," is also the first of a series relating to the art-science in entirely novel aspects It presupposes that the reader has taken to mind the lessons which the two previous parts were intended to convey, in other words, that he has arrived at that most important of stages in the study and practice of photography, namely, the ability to produce a negative What I am now about to teach him is a distinct advance upon this In this and following chapters I purpose showing both what may be done with a negative, and how the taking of a negative may be accomplished without the aid of those conditions which, to the beginner, would reasonably seem indispensable In the First Part of "Practical Photography," I gave instructions for printing from the negative upon paper sensitised with silver This process, delicate and excellent so far as immediate results were concerned, was still attended with one grave defect The results were fugitive, liable to fade away by lapse of time into mere shadows of their former selves I am now about to introduce my readers to printing processes which are permanent, and which in point of results bear favourable comparison with the best of silver printing Nay, more, I shall give an account of photo-mechanical processes by which prints can be produced without even the aid of light, and with a rapidity by the side of which sun printing falls into the shade Again, I have still further attractions to add to my programme I have reserved until now the various means by which photographic transparencies are obtained, and by which the tiny miniature may be enlarged to the most imposing and effective dimensions I have also in store for the attentive and intelligent reader an account of several most feasible methods for producing negatives by artificial light But I must not forestall too much In a word, the present part of the series is to be a compendium of photographic miscellanies, such a compendium as I believe does not exist elsewhere in a form at once comprehensive, collected, and concise With this brief introduction, I will now proceed to the actual task which I have set before myself, merely premising that I shall not repeat the instructions given in the former parts of the series in reference to such points as preparing or procuring emulsions, dry-plates, and the like As I have already remarked, it will be assumed that the reader has at least read the first two parts of "Practical Photography," or else some work containing similar information If he has not, the following chapters may be interesting to him, but can be of little practical use I may mention that "Practical Photography," Parts I and II, have been reprinted separately, and may be procured at *The Bazaar* office, price 1s each Part I. contains a full account of the wet collodion process, together with printing in silver on albumenised paper, Part II is a manual—I believe the fullest and most practical ever published—of dry-plate photography

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CHAPTER II.

THE CARBON PROCESS

THE first miscellaneous photographic operation of which I shall speak to my readers is what is called the carbon process, for producing photographic prints in permanent colour This process is also known by the name of Autotype, and is, on account of the permanence of its results much practised commercially, both in Great Britain and on the Continent There are several patents connected with its practice, which have been, or are at this moment, in the hands of the Autotype Company, of 36, Rathbone-place, London, W The patents now in force govern what is known as the autotype or carbon process by double transfer, and the position of the public with regard to them will be fully explained when dealing with that portion of our subject Before, however, entering upon any practical details, a few words must be said in reference to the Autotype Company itself This is a great commercial establishment, which is devoted both to the production of autotype prints for illustrated works, &c , and to the supply of all kinds of materials connected with the working of the process by others Up to the expiry, which took place a short time ago, of the patent governing that part of the autotype process known as single transfer, and also the manufacture of the carbon *tissue*, the Autotype Company possessed the monopoly of supplying the *tissue*, which is the most important element of autotype printing On the expiry of this patent, however, they threw open to the public the option of buying their tissue wherever they pleased Whilst this disinterested action on their part has given an undoubted impulse to the progress of carbon printing, at the same time the experience of the Autotype Company, and the facilities and improvements which they have introduced in the manufacture of tissue, are such as to cause little doubt that their circle of customers will remain undiminished by the ceding of their monopoly As a fit pendant to the above few words, which I considered necessary, if only to explain the position of the Autotype Company with reference to the process of which they are the fountain-head, I am pleased to be able, unhesitatingly and without reservation, to recommend my readers to procure all their materials for the carbon process from the Autotype Company direct I feel certain that they will as little regret having followed my unusually strong recommendation as I, on my part, shall regret having made it

It is not my intention to go at all into the history of carbon printing, as that does not lie within the scope of the present work Those who wish to learn the steps by which the process has arrived at its present perfection may be referred to the "Autotype Manual," published by the Autotype Company, price 1s This excellent and practical little work is due to Mr J R Sawyer, the manager of the Autotype Company, and the patentee of the flexible support, which will be spoken of hereafter in connection with the double transfer process To its admirable arrangement and lucid explanation I am indebted for much of the present account There is another work on carbon printing which is published by Messrs Low, Marston, and Co, of 188, Fleet-street, E C This is written by a well-known German photographer, Dr Paul Liesegang, and translated into English by Mr R B Marston It is copiously illustrated with woodcuts, and may be had post free from the publishers for 4s

And now let me show my readers what carbon printing really is I have already described it as a process of printing in permanent colours, but this gives little idea either of its capacities or operation It is founded on the action of light upon bichromates, particularly those of potass and ammonia, in conjunction with organic matter—such as, for instance, gelatine As this may seem a little unintelligible to some of my readers, I will illustrate my meaning with an example If I take a sheet of gelatine and steep it in a bichromate of potass solution and then expose it to the light, what will be the result? The sheet of gelatine which before exposure to the light was soluble is now the reverse It follows that if, in exposing the sensitive gelatine sheet to the light, I superpose an ordinary negative, the dense portions in the negative will be represented in the gelatine sheet by portions which, not having been acted on by the light, are still soluble, while the transparent or semi-transparent parts are represented by corresponding insoluble portions of gelatine. If I now place the exposed sheet of gelatine in hot water the soluble portions will be washed out, and the insoluble will remain, forming, in other words, a species of engraved sheet, in which the densities of the negative, that is to say, the high lights in nature, are represented by the reliefs, and *vice versâ*. These results form the general foundation of both the autotype and the photo-mechanical processes which will be noticed in due course In carbon printing the gelatine is mixed with some pigment of the desired colour ground to a powder, and spread upon paper of suitable texture This is called in England tissue The pigmented tissue is sensitised with bichromate of potass, and exposed to light under the negative The latent image is then developed with hot water and finally transferred to a white or tinted paper, which serves as its support There are two methods of transference which I have already alluded to under their respective names of single and double transfer These will be explained separately, for the present it is enough to say that the preliminary operations up to the exposure of the tissue under the negative are identical

The Tissue—I shall not discuss the manufacture of pigmented tissue, as in my opinion it would be a waste of space to do so Pigmented tissue is an article of very extensive commerce, and is sold of standard quality, and of almost every conceivable shade, by the Autotype Company and other firms It is sold by the Autotype Company in bands, 30in wide, and 15ft long, the price being 7s 6d per band Different shades are used for different subjects, and as the beginner in all probability is unaware of the latitude possible in this respect, I give the following list of shades from the Autotype Company's "Manual"

For enlargements and large pictures generally—the *Autotype Purple* or *Autotype Brown*—These colours have for their basis a pure black pigment, modified to a brown or purple tone by permanent blue or red

For engravings—*Engraving Black*—A pure black tissue

For monochromes—*Warm Black*—The black pigment of the preceding colour modified with permanent red

For sepia drawings—*Sepia Tissue*—A preparation exactly resembling the colour of a warm sepia drawing

For red chalk drawings—*Red Chalk Tissue*—As its name implies, a tissue matching a red chalk drawing

For portraits—*Portrait Brown* or *Portrait Purple*

For transparencies, especially intended for the reproduction of negatives—the *Autotype Transparency Tissue*—This is made with filtered colour, shows no grain or texture even when enlarged to 10 or 12 diameters, and is perfect for the production of enlarged negatives

The printer having procured, say, half a band of tissue of a suitable shade for his purpose, should then proceed to cut it up into conveniently sized pieces Many methods of accomplishing this simple operation will readily present themselves The tissue when cut should be stored away in such a manner that when about to be sensitised it should be tolerably flat. This result may be secured by keeping the sheets between metal plates and superposing a sufficiently heavy weight

And now I come to the actual operations by which carbon prints are produced. These are (1) sensitising the tissue, (2) exposure of the tissue under the negative, (3) development of the latent image (4) transference of the image to the final support, (5) concluding operations In describing these I shall adopt the following arrangements To begin with, the two preliminary operations of sensitising and printing will be described consecutively Then will come "Development, &c, Single Transfer," "Development, &c, Double Transfer," and lastly the concluding operations which are common to both single and double transfer To these will be added a few lines of supplement, describing some of the miscellaneous applications of autotype printing

Sensitising —To sensitise carbon tissue it is necessary in the first place to have, as in sensitising albumenised paper with silver, a room adequately screened from the ingress of actinic light As the tissue when sensitised is not much more sensitive than good silvered paper, this requirement will be amply met by a yellow blind It is advisable to have as large a window as possible, for the successive operations in the carbon process require considerable attention, and there is nothing whatever to be gained by cooping oneself up in a really dark room It is as well, if possible, to set aside a room exclusively for the practice of the carbon process, in which not only the operation of sensitising but also that of development may be carried on It need not be very large, but it should most certainly be dry, having an ordinary stove, a tap and a sink for development, and a common deal table for cutting up the tissue and transfer paper, sensitising, &c There are a variety of ways by which an ordinary room may be adapted to this purpose, which will readily suggest themselves

As regards the apparatus requisite for the operation at present under review, namely, that of sensitising, it will be as well to give a list of the indispensable articles before proceeding to describe their application In the first place there is the dish to contain the sensitising solution This may be of tin or zinc, and should be about 2in larger each way than the largest piece of paper to be sensitised As it will have to contain about 2in of the solution, it may be made about 3in deep Besides this, the operator should procure another dish or tray of the same material, only 2in larger each way than the first Accompanying this should be a wooden stool or table to stand about an inch out over the top of it, the dimensions of this may be about 12in by 10in In addition to the two trays and the stool, a squeegee must be procured, also a broad camel's hair brush, an egg boiler, a glass plate of the same superficial dimensions as the larger tray, some sheets of common cardboard larger than the sheets of tissue to be sensitised, and finally some red blotting paper

A squeegee, as applied to the carbon process, is a strip of indiarubber let into a piece of wood, which serves for a handle One to answer the purpose of an amateur, who does not, as a rule, sensitise pieces of tissue of very large dimensions, can be bought for half-a-crown The amateur is advised to spend this sum in preference to making the squeegee himself, as he can save but little by the latter course, and the squeegee is in such constant need that, unless well made, it soon becomes practically useless

The formula for the sensitising bath is charmingly simple Here it is —

BICHROMATE SENSITISING BATH

Pure granulated bichromate of potash	15oz
Water	2gals

Mr Sawyer, in the "Autotype Manual," directs this to be made up in a two gallon earthenware jug, with a piece of muslin tied loosely over the mouth, so as to form a shallow bag The bichromate of potash is put into this, and as much hot water as the jug will hold, or as much as will reach the bichromate salt if it should not all happen to dissolve when you pour hot water over it, the whole is allowed to cool and, when perfectly cold, is ready for use

Bichromate of potash is very cheap, costing about 2d per oz The Autotype Company, we believe, send it out in small bottles, of guaranteed purity, for the special use of those practising their process

Before beginning to sensitise, it is a needful precaution to put an indiarubber finger-stall on the first finger and thumb of each hand The reason for this is, that many, if not most people, are subject to what is known as bichromate poisoning, that is to say, the bichromate solution makes its way through the pores of the skin, and causes considerable pain, besides being productive of other disagreeable results Another method besides the finger stalls, which has been suggested as a preventive of this bichromate poisoning, is to dip the first finger and thumb of each hand into a solution of indiarubber in benzole, and allow them to dry Personally I prefer the finger-stalls

And now for the actual sensitising Place the smaller of the zinc dishes on the table, and fill it to the depth of 2in with the sensitising solution In close juxtaposition to this place the larger dish with the wooden stool standing inside it On the wooden stool lay the sheet of glass Have the squeegee ready to hand, and the egg boiler immediately in front of you.

Now take one of the pieces of tissue, pigmented side downwards, by the extreme ends, between the finger and thumb of each hand, bring the hands together as if about to fold the tissue; lower the tissue until the centre of the pigmented surface just touches the solution, bring down the ends gradually, until the whole pigmented surface floats on the bath, and push the piece of tissue bodily into the bath with the camel's hair brush. Carefully remove, with the brush, all air-bubbles from the back of the tissue, and then, turning the tissue over, do the same for the pigmented surface By this time the sand in the egg boiler, which should have been set going on the immersion of the tissue, will have nearly, if not quite, run out When it has done so, lift the tissue slowly out of the bath by the finger and thumb of each hand After draining for a few seconds hold it over the glass plate, and allow a few drops of the solution to fall on the latter Then carefully lay the piece of tissue upon the plate downwards, and allow it to remain while another piece is immersed in the bath, and the air bubbles removed from it This done, the operator should return to the tissue on the glass plate, and, placing two fingers on one edge, pass the squeegee with moderate firmness slowly and evenly over the back of the tissue By this means it is made surface dry One application of the squeegee should be sufficient The piece of tissue is then raised slowly from the glass plate, and laid face uppermost on a sheet of blotting paper If it comes from the glass plate with difficulty it may be taken for granted that it has remained there too long The remedy is obvious

When the sensitised tissue has been laid on the blotting paper it is ready to be hung up to dry It may be either suspended by wood clips or hung over the cardboards mentioned as one of the necessary paraphernalia for the process These cards are recommended in the *Autotype Manual* to be prepared in the following manner "Tie a piece of fine twine, about 12in long, to the middle of one end of each piece of cardboard, at the other end cut a slit about ½in long exactly opposite, then make a knot in the twine, bend the card into the shape of a bow, slip the twine into the slit, the knot being on the outside, and you have an arch of cardboard to support the blotting paper on which the tissue is to be dried These cardboards can be suspended by passing a cord through them, or arranging splines to stick out from a wall or shelf "

The drying may be carried on in the sensitising room, provided that the latter is warm and dry Mr Sawyer declares that an ordinary fireplace gives the necessary minimum heat and maximum of ventilation, adding that the fulfilment of these conditions is the characteristic of ordinary English stoves If the sensitising is carried on in the evening, and there has been a fire in the room all day, the tissue ought to be dry the next morning It can then be taken down, cut up into the sizes required, and stored away in a tin box between boards, being kept flat by weights Another plan is to have "tin trays fitted with heavy lids just to drop inside them, the lids should be made of wood, with stout sheet lead of the same size as the wood screwed to the bottom By this means the tissue is kept flat in the most convenient form for the pressure frame, and the light and atmosphere perfectly excluded "

I think I cannot do better than incorporate in the present portion of this work the following quotation from Dr Liesegang, the well-known German authority on carbon printing It refers to the sensitising bath, and gives data only obtainable after long and intelligent research —

"After repeated use the bichromate becomes darker in colour, and is then useless For this reason the solution should not be used too sparingly, as soon as the bath loses its golden yellow it should be replaced by fresh solution The tissue will then keep longer, which is always an advantage A five-pint bichromate bath will sensitise one roll of carbon tissue in summer, two rolls in spring, and three rolls in winter

"In summer the bath should be kept as cold as possible, as in a warm bath, especially if it contains much bichromate of potassium, the gelatine will dissolve If necessary the vessel containing the bath should be placed in ice

"The stronger the bath is, the softer will the prints be, the weaker the bath the harder will be the prints Therefore, to print from a hard negative a stronger bath should be used, and to print from a very weak negative a very weak bath is necessary It must be remembered that tissue sensitised in a weak bath is less sensitive, and, therefore, requires longer exposure Too weak a bath yields no half tones, too strong a one produces reticulation (a net work structure) in the print"

It only remains to add that tissue can be obtained ready sensitised from the Autotype Company, at 8s 6d per band This is only 1s more than the band costs unsensitised Sensitised half bands may also be obtained The sensitised tissue keeps good about a fortnight or three weeks

Exposure of the Tissue —In exposing sensitive carbon tissue under a negative it is obvious that one very important deviation must be made from the course adopted in printing with paper sensitised with silver Silvered paper is white and the action of light upon it is clearly perceptible to the eye, but this is not the case with the black pigmented tissue For this reason it is necessary in carbon printing to have some additional guide to correct exposure, and it has been found that this desideratum is supplied by the ordinary silvered paper prepared as directed in the first part of the present work The silvered paper is exposed in a contrivance usually called an *actinometer*, or measurer of ray force, and, due consideration being had to the quality of the negative or negatives being printed from, and to the relative sensitiveness of silver paper and carbon tissue, it is found that the correct exposure can be judged with great accuracy There are various actinometers in vogue, but, for neatness and handiness, the one represented in the cut (Fig 7) is unsurpassed To quote the words of the inventor (written before it became an article of commerce), the Woodbury photometer is a cross

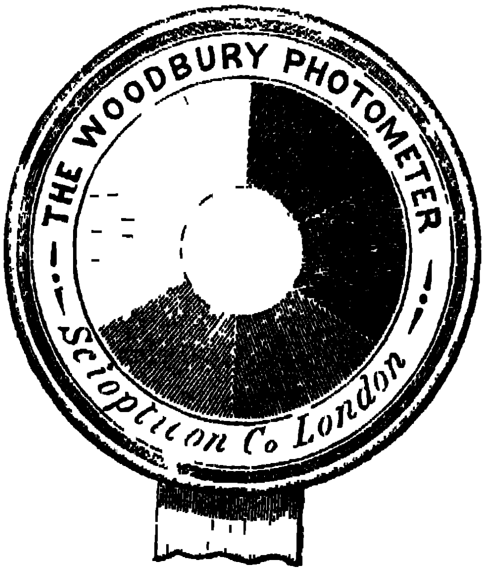

Fig 7 The Woodbury Photometer

between Vogel's actinometer, where a series of layers of transparent paper forms a gentle gradation to opacity, and the instrument sold by the Autotype Company, in which, when the colour of the silvered paper arrives at one tint, the paper is again moved and another tint registered The first has the disadvantage of having to be opened to see to what stage the exposure has arrived, and the other that of requiring to be constantly watched for the moment when one tint is complete, so that a fresh piece of paper may take its place The Woodbury photometer remedies both these defects, and is, moreover, so handy and neatly arranged that to use it is almost a pleasure In shape it is a small disc like a watch, with brass back and glass front The latter protects the face, which is a paper disc, upon which are printed various depths of shade In the centre of the face is a small round orifice The "works" of the instrument consist of a tiny roll of sensitised paper, which passes under the orifice of the face and out through the side, as shown in the illustration The application of the photometer to carbon printing ought to be pretty obvious By preliminary test it is found what tint on the face registers the correct exposure of the tissue required by any particular negative, or, in other words, to what depth silver paper must be printed in order to show that the tissue has been fully exposed After very limited experience the preliminary test will be rendered almost if not quite unnecessary, a glance at the density of the negative to be printed from being quite sufficient It is obvious that if the negative is a particularly dense one the carbon print will not be finished until one of the deep tints has been reached by the sensitised paper, and *vice versâ* The necessary tint being settled upon, the frame containing the negative and the sensitive tissue is carried out into the light, the photometer being held in the hand When the tint has been reached by the silvered paper the printing frame is withdrawn, the print being, so far as exposure is concerned, an accomplished fact If there are other and denser negatives being printed from, the photometer remains untouched until the tints required by them are respectively reached The piece of sensitised paper, which has already done its work and hangs out at the side of the instrument, is given a pull, so that a fresh piece of paper may be released from the roller to pass under the orifice in the face. It only remains, in connection with the Woodbury photometer, to add that it is obtainable of the Sciopticon Company, 157A and 157B, Great Portland-street, London, W. It costs 5s., and is sent by post for 5s. 3d. The illustration, which represents the actual size of the instrument, does not show the discs of non-actinic gelatine, which are used in order to lessen the rapidity by which the light darkens the sensitised paper. Without these the photometer may be used to ascertain the correct exposure for plates in the camera, provided that the films are not over sensitive.

The remainder of the necessary appurtenances for exposing carbon tissue are not sufficiently distinctive to need separate mention. They will obtain notice in the following brief account of the successive operations to be undergone in the actual course of printing.

When the relation between the negative and the actinometer or photometer has been established, the fact should be duly entered either in a book or upon the negative itself. This prevents any confusion or necessity for future preliminary tests. The next operation is to provide the negative with what is technically known as a "safe edge." This is done either by pasting round the edge four strips of paper, or by running round a line of Bates's black varnish to the depth of about ⅛in. The negative is now laid film side upwards in a printing frame, the back of which, by the way, need not be hinged as in silver printing, for the tissue will remain untouched until the printing is completed. A piece of tissue of suitable size is now selected and the surface gently rubbed down with fine muslin or wash-leather. It is then laid on the negative and backed with dry bibulous paper and a piece of American cloth. The frame is closed and carried out into the light, the exposure being judged by means of the actinometer or photometer, as explained above. When the printing is concluded the frame is carried in, and the tissue removed for development. The development should follow the printing as shortly as possible, for the curious reason that light has, upon carbon tissue, a continuating action, causing the image, as it were, to go on printing even in a dark room. This extraordinary phenomenon was discovered by Captain Abney, and may sometimes be turned to good account. For instance, a picture which, through insufficiency of the light, has been only partially printed, can be completed by merely leaving it on a table in a dark room until the next day. Of course this would involve certain calculations, but these need by no means be complicated, and, as Mr. Sawyer says in the "Autotype Manual," it would be perfectly possible to organise a system having these data as a basis. It has been found, moreover, that the knowledge of the continuating action has been proved of practical value in preventing most successfully the washing-up of the half tones of the picture

Development by Single Transfer —The principal item in the requisites for the development of prints by single transfer is the single transfer paper, or support to which the image is transferred from the tissue This, to use the words of the "Autotype Manual," "is a fine paper prepared with a gelatinous or colloid substance, which, although insoluble in water, swells upon immersion, and acquires sufficient adhesive power to hold the picture both during development and finally " The Autotype Company send out the single transfer paper, in bands 12ft long and 30in wide, of either thick or thin texture For portraits a very fine paper in sheets is specially prepared, having a surface to imitate closely that of silver prints on albumenised paper The remaining necessary adjuncts for developing a carbon print by single transfer have been enumerated at the commencement of the present chapter

When the exposed pigmented tissue has been removed from the printing frame, it becomes necessary to cause it to adhere for some minutes to the transfer paper in order to effect the due transference of the latent image This is accomplished as follows We will suppose that, say, a dozen pieces of exposed tissue have just been removed from their respective frames, and that it is desired to proceed immediately with development To begin with, the operator must have at hand a corresponding number of pieces of single transfer paper cut to a size somewhat larger all round than the pieces of tissue A dish or pan of cold water, the squeegee, and some blotting paper will also come into requisition One of the pieces of exposed tissue is then immersed with one of the pieces of transfer paper in the cold water Directly the tissue becomes limp, its surface is brought into contact with that of the transfer paper, and the two, being brought out of the water, are laid upon a piece of zinc or any other level surface, the tissue being uppermost The squeegee is now passed over the back of the tissue two or three times, to squeeze out the water from between it and the transfer paper This done, the operation is repeated, the squeegee being used in the opposite direction, in order to expel the intervening air as well as the water The tissue and the transfer paper being now in contact, are laid between blotting paper, and the preceding operations are repeated with the remaining eleven pieces of exposed tissue This done, the first of the adherent pieces is ready for the next important operation, which consists in developing the latent image upon the transfer paper serving as a support For this will be required a tray filled with water in temperature from 90deg. to 110deg Fahr Almost immediately the coloured gelatine of the tissue will be seen oozing out from the edges The tissue is now taken at one of the corners between the forefinger and the thumb, and drawn gently from the transfer paper The tissue, which is now useless, may be thrown on one side The transfer paper, which now supports the image, presents a slimy appearance, of the colour of the tissue to which it has been lately attached The development of the image is effected by simply splashing the warm water on to the surface of the transfer paper. This clears away by degrees the superfluous pigmented gelatine, leaving, after a minute or two of douching, a permanent picture, complete in detail and perfect in tone

It will be understood that the above results, attainable by so easy a method of working as that described, can hardly be expected except when the exposure of the tissue, in the first instance has been accurately timed For the benefit of my readers, I borrow from Mr Sawyer and the Autotype Company the following words, descriptive of the results of incorrect exposure and explanatory of the accommodating character of the process of which the authority quoted is the representative and referee —

"If the exposure has been too long, the gelatine compound will dissolve with some difficulty, and the resulting picture will be heavy in the shadows, and the lighter tones will be wanting in clearness If, on the other hand, the exposure has been insufficient, the compound will dissolve away quickly, leaving the developed picture bare and chalky in the high lights and lacking vigour in the shadows Of course, a proper exposure insures the most perfect result, but there is an advantage attending this process, that an under or an over exposed picture may be made fairly presentable by modifying the development—using hotter water than usual in the case of an over exposed print, and which may be further reduced by soaking for a time in water at a higher temperature, and, on the other hand, an under-exposed print may often be saved by removing it when partially developed from the warm water, and continuing the development in cooler water"

As the picture becomes a shade or two darker when dry, the operator need not be alarmed at finding it immediately after development a little too light

Directly after development the picture should be plunged into cold water to arrest any further action on the gelatine This done, it should be immersed in a solution of common alum (one part to thirty parts of water) until the yellow colour caused by the bichromate of potash has entirely disappeared Finally, the picture is freed from all trace of the alum by transference to a dish of clean cold water, rinsed, and hung up to dry

Pictures by single transfer, unless from reversed negatives, are necessarily inverted This is of little account in the case of portraits, but renders reversed negatives absolutely necessary in the case of landscapes Methods of securing a reversed negative will be described hereafter

Double Transfer —There are three methods of double transfer applicable to the carbon process In the first, the temporary support (the meaning of which term will be more fully understood when I come to the actual description of the process) is afforded by indiarubber paper, in the second, the double transfer takes place from surfaces impermeable to air or fluid, of which collodionised glass is the usual representative, in the third, the indiarubber paper of the first process is supplanted by a "flexible support" The first process, namely, that of double transfer from indiarubber paper, is practically obsolete The second, particularly as represented by the use of collodionised glass, is greatly in vogue, especially for small work up to, say, 12in by 10in The flexible support is also in considerable use, but more for larger work, in which, from its simplicity and certainty, it is of unquestionable value

Before proceeding to details, there is an important point which I find it necessary to put plainly and simply before my readers This relates to the position of the public towards the Autotype Company, and *vice versâ*, in respect to patent rights Briefly, the matter stands thus On the 28th of February, 1878, expired the first of the series of patents acquired by the Autotype Company, and by its expiry the public were set free to practise (1) the preparation of coloured gelatinous tissues, (2) the production of photographs by what is known as the single transfer, (3) the production of photographs by the double transfer process, indiarubber paper being used as the temporary support

But besides this expired patent there are in the hands of the company five further patents, the earliest of which does not apparently expire until 1883 These are fully given in the Autotype Manual, and their application explained, but their recapitulation here would be unnecessary waste of space It will be better for us to explain the action of the Autotype Company with regard to these patents as affecting the public, amateur and professional In the first place, the right of employing these patents is granted through licences, which are of two kinds —chromotype and autotype The fee for the chromotype licence is £20 to professional photographers, but we believe a very great reduction indeed is made to amateurs A chromotype licensee may practise double transfer from collodionised glass, &c, and from the flexible support He is also free to adopt certain improvements in photographic printing frames, and in the production of enlargements, &c, introduced by M Lambert, a great authority on carbon work, finally, he is entitled (1) to the exclusive use of three tissues approved by Lambert, as well as all the other tissues made by the Company, (2) to full instruction at the Autotype Works in chromotype printing and production of enlargements, (3) to the right to use the Company's registered trade mark, "Chromotype," (4) to a discount of 10 per cent from the market price of the Company's tissues The autotype licence, for which the fee is for professional photographers £5, and for amateurs only 5s, empowers the licensee to practise double transfer from surfaces impermeable to air or fluid (collodionised and plain glass, porcelain, opal, metal plates, &c), and from Sawyer's patented flexible support, which is described as a simple means of producing double transfer prints for transference to paper, ivory, opal, canvas, wood, &c

Now, all this about patent rights may seem very wearisome and unnecessary, but it is in reality important There is no end to the mistakes and complications which may arise out of ignorance, even though it be unstudied and genuine, of patent restrictions, and surely it is only fair and honourable towards legitimate commercial enterprise to respect the few barriers it temporarily erects for its own defence In the present instance, although the system of licences adopted by the Autotype Company be deprecated by some and chafed at by others, it is undoubtedly fair and above-board, while all accidental confusion and error with regard to them is rendered as far as possible remote by the elaborate explanation published by the Company itself with regard to its position

The exposure of the tissue in the double transfer processes is carried out in identically the same manner as that already described in connection with single transfer The process may thus be said to begin at the point when the exposed tissue is removed from the frames preparatory to development, which is carried out as follows —

Development, &c, by double transfer —The first requisite for development is a number of glass plates to serve as the temporary support Opal glass is decidedly preferable to ordinary glass, as the developed image is much more easily watched upon it Ordinary glass, however, will serve if held during development in front of a piece of white paper The plates, which should be a little larger all round than the pieces of exposed tissue, must now be waxed, which is accomplished with the aid of a compound made up by dissolving 100grs of pure beeswax in 20oz of pure benzole This is first rubbed into the plate with a pad of "papier Joseph," and then polished off lightly with a long clean pad of the same material. If the polishing is done too thoroughly the picture is liable to stick I believe that French chalk, used as in preparing plates for the reception of a coating of emulsion, may be employed with success instead of the wax solution in benzole If waxed, the plates may be stored away for future use, all dust on their surfaces being removed with a camel's hair brush

The collodionising of the plates is the next step towards rendering them fit to serve as the temporary support during development This is done just as in the case of coating a plate with collodion for the negative processes The collodion should be plain and thin, the following formula will serve —

PLAIN COLLODION

Pyroxyline	12grs
Ether (methylated)	2oz
Alcohol (methylated)	2oz

When the collodion is well set, the plate is washed in clean cold water until the greasiness has disappeared Then take a piece of the exposed tissue, and placing it in a dish filled with clean cold water, allow it to remain there until it becomes limp In the meantime lay the rinsed collodionized plate in a position handy to the immersed tissue, allowing the surface to remain covered with water, so that the tissue may be subsequently adjusted before the squeegeing takes place Take the limp sheet from the water, and gently and gradually let it down middle first and ends successively upon the plate Superpose a piece of india-rubber cloth, and gently, but firmly, squeege out the intervening water The plate may then be laid down on a flat table, covered with blotting paper, and subjected to pressure for from five to fifteen minutes The easiest method of doing this is to cover the blotting paper with an ordinary glass plate, and lay a weight on the top The same process may be repeated with say a dozen plates, the weight being removed as each new plate, with its accompanying piece of tissue, requires to be subjected to pressure Vignettes or pictures with intended white margins should not remain under pressure for more than five minutes, for fear of injuring the purity of the whites

The plate, after pressure, is laid in warm water of a temperature not exceeding 100 deg, and (air bubbles being removed) is allowed to remain there until, as in the single transfer process, the pigment begins to exude at the edges of the tissue A corner of the latter is now raised and the whole skinned gently off The water is now dashed on to the plate, and the picture allowed gently and gradually to develop When the development is complete the plate is rinsed in cold water, flowed with an aqueous solution of alum—one part to twenty—rinsed again, and reared up to dry If no retouching be required the drying may be dispensed with, and the transfer paper applied while the plate is still wet from the last rinsing

The Autotype Company recommend for development a plan suggested many years ago by Mr. Johnson, which was "to have a vertical grooved box in which the plates, after being skinned and the water well dashed over them, were placed to develope by themselves, the vertical position of the box giving, of course, every facility for the unfixed pigment to disengage itself, and leave the picture perfectly developed If the plan of the vertical box be adopted, one made to hold a dozen plates will be sufficient, and by the time the last one is put in the first will probably be completely developed, requiring, perhaps, only a little rinsing with warm water to make it complete ''

In double transfer from collodionised glass any retouching or spotting must be done before the final transfer takes place, to prevent detriment to the brilliant gloss which is characteristic of these pictures We have seen no neater means of accomplishing this than the following method proposed by Canon Beechey and extracted from the Almanac for 1877 of the *British Journal of Photography* —" Your prints on the glass being quite dry, take them one by one to your retouching table, and examine them well If you find any transparent spots on them, or if in consequence of undue exposure the detail in the high lights has not come out, you can now remedy these defects in a very neat and simple manner Have by you a cup of hot water, and a very fine pointed camel's hair brush Take a slip of plain tissue, give it a soak in the hot water, lay it on your palette, and *use it for colour,* warm your plate, use hot water with your brush, and you will soon be able to touch-in the missing parts so that you will not be able to perceive that they were not printed By this means I have touched in many a distant mountain which had almost mingled with the sky, and deepened many details in the dark shadows, which have greatly strengthened the picture As the colour you use is exactly that of the print, and moreover it is gelatinous, you can work up the drawing with unfailing equality " It will be remembered that a similar method to the above was proposed by Mr Henry Cooper for spotting enamelled silver prints

The Final Transfer —It now remains to transfer the picture resting on the glass, which is its temporary support, to the paper destined to be its final one This latter is of a special character, and, to distinguish it from that used in the single transfer process, is called double transfer paper. The following particulars relative to it are furnished by the Autotype Company, who describe it as a paper coated with an enamel composition, insoluble in cold water, but becoming soft and slimy in water heated to a temperature of 120deg or 130deg. The enamel hides the fibres of the paper, and, containing opaque pigment, may be tinted or toned to any shade The paper itself is made in bands 12ft long by 30in wide, in either thick or thin substance, and in three shades of colour—viz , opal, azure, and rose The azure being a very delicate blue tint has the peculiar advantage of enhancing the brilliancy of the high lights For portrait work the transfer paper is made in sheets very carefully by hand (also in the three tints named above), and coated with a dense pigment which entirely hides the fibre of the paper When required for use the transfer paper is cut up into sizes a little larger each way than the plates supporting the pictures, as many pieces as are wanted are then immersed in cold water for about half an hour until the gelatine is swelled Now take one of the glass plates supporting the pictures, rinse it under the tap and lay it down with the water still on the surface Pass a piece of the transfer paper through water, warm to about 110deg (a few seconds' immersion will produce the desired "sliminess"), and lay the gelatine surface down on the plate, *lightly* forcing out the intervening water with

If only unmounted pictures are desired, it merely remains to rear up the plates and the accompanying pieces of transfer paper to dry When perfectly dry apply a penknife to the edges, and the pictures will peel off, exhibiting a full and most brilliant gloss They should now be rolled collodion side outwards over something round of small diameter, to prevent their curling, as they will do unless this plan be resorted to If it be desired to obtain mounted pictures with full gloss, the directions given under the heading of mounting should be followed

Double Transfer from the Flexible Support —In this process a flexible support, invented and patented by Mr Sawyer, takes the place of the collodionised glass, the method of working with which is described in the preceding section In its use it is substantially the same as the collodionised glass, except in the case of the spotting or retouching, which cannot, as with collodionised glass, take place on the support itself, but must be reserved until the final transfer has been accomplished, when the pictures are spotted or retouched like ordinary silver prints Mr. Sawyer gives the following particulars of the Flexible Support, which should be noted by the operator In the first place, as to its composition, it is a paper made specially for the purpose, "coated by steam machinery very evenly with a solution of gelatine rendered insoluble by means of chrome alum When perfectly dry, this is again coated with a solution made by dissolving button lac or bleached lac in an aqueous solution of soda and borax, this is then dried and rolled with powerful pressure between polished plates Before using it must be treated in the following manner. Rub the glazed surface with a piece of soft flannel moistened with a little of a waxing compound composed as follows, yellow resin 6dr, pure bees' wax 2dr, turpentine 1 pint, having rubbed this well into the surface coating, polish it off with a second piece of flannel, let it remain for a few minutes for the turpentine to evaporate, and it will be ready for use "

Recent improvements have been introduced which enable the Flexible Support to be used twenty times over, but it requires rewaxing each time before use

Mounting —All autotype prints may be mounted in exactly the same way as silver prints, by the same mounting media, and finished by the same subsequent burnishing, care being taken in the latter case that the print is quite dry before submitting it to the roller A preliminary warming is advisable

Autotype prints by double transfer from collodionised glass may be mounted with very thin starch and rolled, this gives the appearance of very brilliant albumenised paper If it be desired to imitate the surface of ordinary albumenised paper, the prints after stripping from the glass plates may be laid for an hour or so between sheets of damp blotting paper, and mounted while still damp

The Autotype Company give the following directions for the benefit of those who desire to mount double transfer prints from collodionised glass with full gloss " To accomplish mounting with full gloss some little practice and care is necessary Prepare some very thick dextrine paste by stirring dextrine into water, adding it little by little till a very thick mucilage is obtained It should be quite stiff, and have no lumps in it Place the cards upon which you propose to mount between damp blotting paper till they are quite limp and pliable, then, having the transfer paper on the pictures only surface dry, rub the thick dextrine well into the paper, and treat one side of the card in the same manner, lay the card down on the plate, and press every part into close contact, put the plates under pressure, with alternate sheets of damp blotting paper, for half an hour, then take them out, and put thin splines of wood round the edges, securing them with American clips, this will prevent their splitting off in the drying."

In mounting cartes, cabinets, &c, on the various cards designed peculiarly for these sizes, it will be necessary to mark on the transfer paper two corners (diagonals) of each picture as a guide where to lay the cards, This can be done by holding up the plate to the window, where the paper can be seen through and the position of the corners determined.

When thoroughly dry the cards may be easily stripped off the plate.

Carbon Prints on Opal —One of the most charming, if not the most charming, of all the many applications of carbon printing is the production by its means of pictures on opal glass Happily, moreover, this process is by no means a difficult one, in fact, anyone who can print decently in carbon by either single or double transfer on paper ought to meet with similar success in working with opal Perhaps the only point where the beginner is liable to be led astray lies in the selection of the kind of glass to be used and the nature of its surface. There are two general classes of opal glass in the market, one of which, "pot metal," as it is called, is, if we may coin a word, opalined throughout, while the other, known as "flashed," has only a thin stratum of opal, the remainder of the glass being transparent Of these two the "pot metal" is distinctly to be preferred Again, as to the surface and "grain" of the glass The opal plate should be polished on one side and ground on the other The grain should not be produced either by fluoric acid or by what is known as the sand-blast process in which a blast of fine sand is directed against the glass, causing numerous little cavities which are the source of endless vexation of spirit to the carbon worker In a word, to quote the *Photographic News*, "The only proper kind of opal to use is hand smoothed opal, medium grain, neither too fine nor too coarse, the former not affording sufficient tooth to hold the picture safely, the latter giving a disagreeable coarse appearance to the finished work" It may be added that glass of this kind should be obtainable at the rate of a dozen whole plates for about 10s James Phillips and Co, 180, Bishopsgate street Without, London, E C, may be mentioned as a firm well known for the supply of photographic glass

As regards the colour suitable for the production of carbon pictures upon opal, the standard Portrait Brown tissue, as supplied by the Autotype Company, may be recommended for general purposes In particular cases, of course, other tints may be used with advantage, but the warm brown is a good all round colour, and may always be relied on Our readers may, perhaps, have seen Mr Faulkner's well-known portraits of children printed in a red tint, in these the Autotype Company's "red chalk" tissue has been used with extreme skilfulness and corresponding success

To turn to the actual operations of carbon printing on opal, it is first necessary to see if the negatives to be printed on are reversed or otherwise, as upon these conditions depends, to a great extent, the future manipulation If the negative be one taken in the ordinary way—that is, non-reversed—the double transfer process must be resorted to, if reversed, a single transfer will be sufficient.

To take the case of a reversed negative, first let us suppose that the tissue has been already printed to the requisite depth and removed from the frame. All that remains is to lay down the opal plate, which should have previously undergone a thorough cleaning, and, after plunging the exposed tissue in water, to squeegee it on to the opal exactly as the exposed tissue is squeegeed on to the transfer paper in the single transfer process The development, washing, fixing in the alum solution, and final drying are substantially the same as in the single transfer process, the opal plate throughout representing the single transfer paper.

In working with a non-reversed or ordinary negative, the image on exposed tissue is transferred to the flexible support, and there developed and dried The next operation is to assimilate the surface of the opal to that of double transfer paper, which is accomplished in the following manner A solution of chrome alum, 12gr to the ounce of warm water, is rapidly stirred into a solution of Nelson's No 1 gelatine, 1oz to 9oz water, the solution being brought about by first swelling the gelatine in cold water and subsequently increasing heat until the gelatine is dissolved The opal plate is treated with as much of the above warm mixture as it will hold (either by the help of a tray or a levelling stand), and the flexible support, having been immersed in cold water, is squeegeed gently on to the opal When perfectly dry the support may be peeled off, the picture remaining on the surface of the opal

Pictures on opal may be easily worked up either in monochrome or colours, so as to present a very finished and artistic appearance

For further information on the subject of carbon pictures on opal, I have great pleasure in referring my readers to an exhaustive account of the process given by Mr T R Sawyer, under the heading of "Topics of the Day," in the *Photographic News* for 5th March, 1880

Miscellaneous Applications of Carbon Printing —Much as I should enjoy doing so, I fear I can hardly detail here all the various uses to which carbon printing may be most satisfactorily applied I will, however, give a bare mention of some of these, as even the mere knowledge of what a process *can* do is often instructive For all further details I must refer my readers to the *Autotype Manual* In the first place, carbon printing can be turned to account in providing a permanent basis for miniature painting on ivory For this the directions given under the head of carbon pictures on opal may be substantially followed, with the exception that, to avoid staining the ivory, the double transfer process should in all cases be resorted to

Carbon printing provides a basis for work in crayon, water-colour, &c , upon ordinary drawing paper, also for oil colour on canvas and panel Furthermore, it is used for reproducing drawings on wood, to serve as a guide for the engraver. Lastly, it is of peculiar utility for the production of transparencies of great excellence for decorative purposes, for lantern slides, and especially for enlargements. The use of carbon printing in the manufacture of transparencies will be illustrated in dealing with that particular branch of photographic production, and also with the hardly less important subject of enlarging

Defects and Failures —As there is nothing perfect under the sun, so carbon printing, with all its beauties and its comparative facility of manipulation, has various little backslidings, which occasionally recur to plague its devotees and shake their faith It is only fair to state that these defects and failures—I hope my readers will understand the delicate distinction between the two words—are, considering the number and the nature of the operations involved in the process, remarkably few and far between Moreover, they may be said to be due, as I shall endeavour to point out, more to the operator than to any inherent shortcoming in the process It would be most satisfactory, indeed, if this chapter were consequently unnecessary, that is to say, if operators were so intelligent as to discover and rectify their errors without exterior assistance , but this, it is to be feared, is hardly the general rule Nevertheless, the operator may render the following list of defects and failures even more complete—in fact, exhaustive—by charitably bearing in mind the warning which needs such frequent repetition, to look to their own want of care and skill before blaming the tools and materials which wiser and more practised brains have placed at their disposal

Probably the most formidable and troublesome failure to be met with in carbon printing is one known as reticulation, or a network structure of fine lines covering the whole surface of the plate in the double transfer process with collodionised glass, to which process it is peculiar The origin of this is over-rapid drying after sensitising

Insolubility of the tissue, that is to say, when the tissue refuses to adhere to the transfer paper or the image refuses to develope, is due (1) to the presence of excessive free acid in the bichromate bath, (2) to exactly the reverse cause to which reticulation is due, namely, too protracted desiccation, (3) to the action of white light during drying or any period (except, of course, the exposure) of the operations, and (4) to the fact that the tissue has been kept too long after sensitising

The washing up of portions of the picture in single transfer, and in the first transfer of double transfer, is generally due to over long immersion of the exposed tissue before squeegeeing it on the temporary support Occasionally it occurs when there are deep shadows quite at the edges of a picture, these being liable to wash up from the margin of the negative having been masked This may be remedied by only partially masking the margin of the negative by using a thin margin of paper or paint, which allows a tint or two in advance of absolute whiteness to be printed.

The washing away of the half tones is usually due to the same cause as that already assigned for reticulation, namely, undue haste in drying the tissue after sensitising

The washing up of the picture *bodily* in double transfer from collodionised glass is occasionally due to the fact that the collodion before immersion in water is not properly set Sometimes, moreover, when the surface of the collodion has been broken, water is imprisoned between it and transferred tissue, thus injuring the development

When the picture in the double transfer process refuses to leave the glass, the defect is owing to the plate not having been properly waxed This *contretemps* is usually met with in working with new glass plates, which must not be polished too closely after waxing

An unpleasant grain or texture in the picture after development may usually be attributed to a defective sample of transfer paper

Shining lines and specks occurring where deep shadows are in close proximity to high lights arise from the transfer paper not having been sufficiently soaked to render it pliable.

Besides the above defects and failures, there are bubbles and froth-like marking due to the intervention of air, the bubbles of which should always be most carefully excluded

Lastly, there are defects, principally represented by over-readiness of the picture to develope and consequent weakness in tone, arising from the bichromate bath not having been made of sufficient strength, or having lost its strength by use

General Hints —Keep the sensitising bath cool, if necessary, with the aid of ice

Practice squeegeeing carefully, as by a wrong method air-bubbles and water are not sufficiently expelled

Do not use the tissue for a day or two after sensitising

After skinning the tissue off the temporary support, do not be chary of the warm water, but dash it on vigorously

Double transfer paper hardens by long keeping When newly made, water of 80deg or 90deg will soften its surface, but after a time 120deg or 130deg will be necessary

CHAPTER III

THE PLATINOTYPE PROCESS

THE process we are about to describe is one introduced and patented by Mr W Willis, jun As its name suggests, it is a process for producing prints in platinum, and it is based upon the discovery that when a solution of ferrous oxalate in oxalate of potash is added to a salt of platinum—chloride, for instance—metallic platinum is immediately precipitated It is not necessary in the present case to go into the scientific details governing the preparation of sensitised paper for platinotype, as —if for no other reason—the sole right of preparation is in the hands of a company holding Mr Willis's patent, and acting as general agents for all articles connected with the process It will be enough to say that on exposing a piece of paper sensitised with salts of iron and platinum under a negative, a brown image of ferrous oxalate is produced, which, on being subjected to a "developer" of oxalate of potash, is reduced, and replaced by a black image of metallic platinum The chief merits of the process consist in permanency of results, great ease of manipulation, and high artistic value in point of colour

On the first introduction of the process there were various defects attached to it, which militated considerably against its popularity. By recent improvements these defects have been happily removed, and the process now stands forward as a candidate for popular favour, backed up by such strong recommendation that it has been determined to afford my readers every chance of at least giving a fair trial to the new power put into their hands.

Like the carbon process, platinotype is, as regards the supply of materials and the licence to work the process, in the hands of a company. Their address is the Platinotype Company, 2, St. Mildred's-terrace, Lee, London, S.E., and to them application for licences must be made. These last are granted for the whole term of the patent, and will be kept in force by an annual payment on the part of a professional photographer of £2 2s. To amateurs licences will be granted on payment of 2s. 6d.

for expenses. A trial, however, is allowed with a small quantity of materials procurable at the usual price, without a licence. All licences will be subject to the condition that the sensitised paper and the chemicals used for developing be purchased from the company.

And now let us turn to consider the apparatus and chemicals requisite for the practice of platinotype. As regards the former, there is little enough to be said. First will come what is called a "calcium tube," in which to keep the sensitised paper. It is a *sine quâ non* in platinotype that the sensitised paper should be free from any suspicion of damp, and for this reason it is considered necessary to keep it in the continual presence—both before and after exposure—of calcium chloride, which has the well known property of absorbing the most imperceptible amount of moisture. To facilitate the accomplishment of this object, tin tubes are constructed having a perforated receptacle to hold a sufficient quantity of calcium chloride, and called, therefore, calcium tubes. A calcium tube 3in in diameter costs 3s , tubes of 4in and 6in in diameter may be had for 4s and 5s respectively. The smallest of these sizes holds a quarter of a quire of sensitised paper comfortably. When the calcium chloride in the perforated receptacle has become damp it should be removed, and not replaced until perfectly dry. It may be dried over a fire on a shovel.

For actual printing the ordinary frames are employed. Great care should be taken to render both the frames and pads as free as possible from moisture. The Platinotype Company, in their circular of instructions for working the process, recommend the employment of sheets of thin vulcanised indiarubber, which may with great advantage be placed between the sensitised paper and the back of the frame.

In development some sort of dish is required which will allow, as will be shown, the developing solution to be heated in it to about 180deg. A porcelain tray *may* be used if care be taken to screen it from the direct action of the source of heat, but by far the best article for the purpose is a dish of enamelled iron. These are purchasable from the Platinotype Company, one measuring about 10in by 7in (this is sufficiently large for whole-plate prints) costing but 1s 7d. The heating agent for raising the temperature may be a Bunsen burner, with rose burner to spread the flame, or any other kindred contrivance. We find an oil stove answers admirably. Besides the iron dish used for developing, a tray or basin will be required for clearing. This may be of porcelain or glass.

The sensitised paper is sold in sheets, like albumenised paper, and of the same dimensions. Before exposure to light it is of a lemon yellow colour. It is recommended for the beginner to purchase, say, a quarter of a quire of this paper, which is sold at the rate of 22s per quire On receiving it from the company it should at once be transferred to the calcium tube, care, of course, being, moreover, taken that all actinic light be rigorously excluded when handling it during the process of printing

The developing agent, oxalate of potash, is obtainable from the Platinotype Company at the rate of 1s 6d per lb Sufficient to develope prints from a quire of paper costs 9d

The hydrochloric acid, used in very weak solution for clearing, is procurable of any chemist, photographic or otherwise, and ought not to cost more than 1s 6d per lb

Altogether, the photographer wishing to make a trial of the platinotype process may do so in a very thorough manner for the following amount Quarter of a quire of sensitised paper, 5s 2d , 3in calcium tube, 3s , enamelled iron dish, 1s 7d , oxalate of potash, say, 3d , hydrochloric acid, say, 1d , licence, 2s 6d , total, 13s 7d For this outlay about 200 carte de visite prints may be secured, while, of course, in the event of the trial being satisfactory, as it is sure to be, the cost of the tube, the iron tray, and the licence will not have to be repeated The price of a porcelain tray for clearing is not taken into account, as, although it is insignificant, the tray may be dispensed with, and a common hand-basin used instead

And now let us consider the actual *modus operandi* of the platinotype process Let us imagine that the sensitised paper has already been cut up into suitable sizes, and that a piece of it has been placed along with a negative in the printing frame There now remain three principal operations to be performed, namely, exposure, development, and clearing, which will now be detailed under their respective heads

Exposure —A significant fact in connection with platinotype is that, whether the exposure takes place in direct sunlight or in shade, the results are precisely the same This property is frequently of considerable value, as is also the uniformity of tone obtainable in platinotypes. As regards the length of the exposure, a very limited experience will enable the operator to decide when the paper has been sufficiently occupied. As already mentioned, the paper before exposure is of a lemon yellow colour, but, after being acted upon by the light, it becomes a pale greyish brown. If there be too much plain glass about a negative with strong contrasts, the deep shadows of a platinotype print from it assume a dingy orange tint, which is lighter than less heavy parts of the picture This means that complete deoxidation of the iron salt has taken place, and that the action of light will produce no further effect Solarisation is the name given the process by which this change is brought about. The inspection of the print is managed in precisely the same manner as that adopted in silver printing, and the print, when the exposure is completed, if development does not follow immediately, should be protected from damp by being placed in a tin containing a little dry calcium chloride, or by being returned to the calcium tube

Development — As the sensitised paper is extremely durable, the development may or may not immediately follow the exposure, according to the convenience of the operator The following is the formula for the developer

DEVELOPER FOR PLATINOTYPES.

Oxalate of potash	130gr
Water	1oz

This, as it will keep indefinitely, may be made up in quantity To develope a print the developer is poured into the iron dish and heated to a temperature of about 170deg , if the print has been over-exposed, a lower temperature may save it, and, *vice versâ*, a higher temperature may improve an under-exposed one The print is now floated on the surface of the developer for a few seconds Almost instantaneously the yellow tint disappears, and the greyish-brown image gives way to one of a beautiful warm black, the high lights exhibiting extreme purity and the half-tones being rendered in exquisite delicacy and detail

Clearing —To clear the developed prints it is necessary to wash them in two baths of hydrochloric acid and water, one part of the former to eighty parts of the latter The prints should remain for eight or ten minutes face downwards in each of the two baths, the solution being agitated in order to give it free access to the surface of the print The second bath should be thrown away as soon as it becomes discoloured and a fresh one prepared in its stead To finish the prints they are rinsed and well washed for about half an hour, and dried preferably across glass rods or tubes

General Hints —Failures, which are singularly uncommon, are usually to be attributed to the sensitised paper having been affected by damp, causing it to print slowly, and producing weak, muddy tones Granularity is occasionally caused by the use of a developer at too low a temperature.

Great latitude is allowable in the temperature of the developer, from 100deg to 180deg not making any greatly appreciable difference At the same time, a standard temperature of 170deg or more is recommended, and exposures should be timed accordingly

When using the developer a second or subsequent time, the green crystals which may have formed should be left behind and thrown away, the solution being decanted from them and replenished from an unused solution of the same composition.

Prints of large size may be slowly pulled over a narrow trough containing the developer, it not being absolutely necessary to actually float them on the surface of the solution

Developed prints should never be transferred immediately to plain water before clearing

Such few residues as may be left over may be treated in the manner described in the circular sent out by the Platinotype Company

Concluding Remarks — Considering the comparative novelty of the platinotype process—at any rate, in its lately improved form—it will be well to give a few words to the claims it puts forward to popular adoption In the first place, it may be looked upon as permanent, owing to the undoubted stability of the metallic platinum forming the image The quality of permanence is, as we have already seen, shared by the carbon process, but then, again, platinotype is decidedly the superior of autotype in ease of manipulation Indeed, the facility, certainty, and rapidity of the process combine to render it an excellent means of securing proofs from a negative before sending it to be printed It is a curious fact that if you show anyone a really good platinotype, printed, say, with a mask, and abounding in delicate half-tones and brilliant lights, he or she will admire it immensely, and declare it to be better than any "photograph" But show the same person a silver print from the same negative, and judgment will at once be given in its favour. Why? Simply because there is a deep-rooted prejudice (for the most part utterly unreasonable) in favour of the tones and gloss of a silver print on albumenised paper No one will deny that the platinotype is far more artistic, and possibly some day the prejudice which does so much to render this most prominent merit invalid will disappear, at any rate, the day has come when platinotype can afford to stand on its own ground, since photographers of high standing have definitely acknowledged it by their own action to be the best of all means for printing landscape studies of any considerable dimensions.

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CHAPTER IV

Photo-mechanical Processes—Introductory and Explanatory

Before going into the particulars connected with the various processes which this chapter is intended to elucidate, the attention of my readers must be drawn to what may be called the esoteric, or more than surface-deep, importance of the subject. When an art or science has reached that point at which the necessity, or, at any rate, the desirability, of mechanical aid becomes apparent, it may be assumed that the art or science in question has made considerable progress since its earliest development. But when the subsequent adaptation of machinery or mechanical appliances has been successfully accomplished, the fact becomes not only interesting, but noteworthy. It is this stage which photography has reached, and it is in this aspect that it claims the close attention of those to whom its advancement is a matter of interest or concern. For it is hardly too much to say that in the development of mechanical appliances the future of photography chiefly lies.

Indeed, it may almost be said that the progress made by photography, as a science, will be insignificant compared to the strides it will make at no distant period towards becoming one of the most useful of the every-day arts by which our common comforts, as well as our æsthetic tastes, are studied. In other words, to use an isolated illustration, the result of a year added to its history may find photography not only more popular, as being endued with greater facility and so forth of manipulation, but as being capable even of supplanting such time-honoured arts as engraving on copper, steel, and wood. Indeed, the advances made in this direction are already considerable, as will presently be shown and proved. That these advances will ultimately lead to results which perhaps few of us can even imagine, must be left to time, and to the fair development of the exertions made, if silently, still surely, by the triple alliance of genius, experiment, and hard work.

The majority of the photo-mechanical processes in vogue are based upon a principle identical with that underlying the carbon processes already described, that is to say, the insolubility imparted to organic matter in combination with a bichromate, by exposure to actinic light An illustration of this will be found in[1] Chap I, where the production of a relief on a sheet of gelatine, sensitised in bichromate of potassium, exposed under a negative and then washed, is explained, as far as such results admit of general explanation The principles involved are applied in various ways to the production of reliefs on various surfaces, glass and stone being the most usual The subsequent inking in of the relief, or of a cast from the relief, and the ' pulling " of proofs, will be explained under the headings of the different processes

Before going further, I may mention that the reader will profit greatly by reference on the subject of photo-mechanical processes to a most charming work, called " A History and Handbook of Photography," and written by M Gaston Tissandier This book has been translated from the French by Mr J Thomson, and for the sake of those who may not have seen it mentioned in other parts of this work, I may remark that it is published by Messrs Low and Marston, of 188, Fleet-street, E C In my opinion, the chapters on photo mechanical processes are the best in the whole book, not so much for details of practical working and so on, as for the most interesting and instructive sketch given of the various stages by which mechanism applied to photography has arrived at its present position Practical details will be found in the present chapter, but historical sketches are not comprised within the limits necessarily imposed upon a work like " Practical Photography " Nevertheless, I am pleased to be in a position to recommend to my readers a most reliable and attractive book, where all my unavoidable deficiencies on this score will be found amply supplied and made good I may add, that I think it more than probable that some of the bygone processes to which M. Tissandier as an historian gives a place, although years ago they may have proved comparatively unsuccessful, are in these days of increased knowledge susceptible of such improvement as may place them on a level with the best of existing methods

Photo-mechanical processes may be classed under two broad headings, namely, those which are instrumental in producing a relief, like that of a wood block, and those in which the print is obtained from a surface where the sunken portions represent shades, as in an engraved copper or steel plate. Technically speaking, they may be subdivided into " Photo-collotype," " Photo-engraving," " Photo-typography," " Photo-lithography," and " Woodburytype "

Photo-collotype is the reproduction of prints from a colloid surface, such as gelatine, the relief on which, caused by admixture of a bichromate and exposure to light, is inked in with a fatty ink, a piece of paper is then superposed, the whole passed through the press, and the paper now impressed with the picture withdrawn The results of this process are in many cases extremely beautiful, possessing a dead black or other tone, and resembling prints produced by the process lately described under the heading of platinotype They do not require mounting, as with the aid of a mask they may be printed with clean margins, but they have the obvious disadvantage of not being able to be printed from along with ordinary type in a typographic press Like all other photo-mechanical prints, photo-collotypes are permanent

Photo-engraving may be briefly described as a means of producing, with the aid of photography, relief plates suitable for being printed from in a steel or copper-plate press

Photo-typography embraces all the processes by which a relief is obtained that can be printed from along with type It is in this direction that mechanical photography requires the greatest advancement, for the desirability of producing a photographic reproduction, which in a short space of time can be made to serve as a wood block, is one which few will care to repudiate

Photo-lithography is, as its name implies, merely a means of supplanting the image produced on stone in the ordinary method of lithography by one which owes its origin to photography It is used principally for the reproduction of maps, plans, MSS , &c

Woodburytype is a most extraordinary process, invented by the great photographic *savant*, Mr Walter Woodbury By its means prints are produced at remarkable speed, which are indistinguishable, except by a practised eye, from the most brilliant silver prints Woodburytypes have the one disadvantage of requiring to be mounted The method of producing them, in common with photo-collotypes, photo-typographs, and photo-lithographs will be described separately and practically

Photo-collotype —There are various collotype processes in vogue, all of which, while founded on identical principles and only differing in the details of their formulæ, doubtless possess distinctive merits The "Lichtdruck," or light printing, as practised in Germany, the collotype process, as introduced by Mr J R Sawyer, and extensively worked by the Autotype Company, the collographic process of Mr A Pumphrey, of Birmingham, and the photo-collotype process of Major Waterhouse, are all more or less the same, and all more or less connected with the original French processes practised by Tessié du Mothay, Marechal, and later by Geymet and others, and this fact materially increases the difficulty one experiences in choosing a process which shall be suited to the scope of articles like the present, and shall, moreover, possess the three necessary qualifications of thorough practicability, simplicity, and power of yielding work of standard quality After careful consideration I have determined to place before my readers the outlines of the process already mentioned as due to Major Waterhouse, of the Bengal Staff Corps. It is more than possible that my readers will find that their own convenience will be studied by the acceptance of any modifications that may occur to them in choosing a press, in the adoption of any particular form of roller, in changing the nature of the supports, and other points upon which the following instructions need hardly be considered imperative

Major Waterhouse, who, as Assistant Surveyor-General of India, has had peculiar advantages for studying the applications of photo-collotype to the production, in particular, of maps and plans, describes his process in pp 30, 31, of the "Year Book of Photography" for 1877, to which we are indebted for the following extract —"It is the result of an attempt to find a simple method which should be comparatively independent of changes of weather and temperature It possesses the additional advantage that the sensitive surface may be easily prepared with a minimum of material, evenly and rapidly desiccated, whilst possessing great sensitiveness lasting for some days, good adhesion to the support, and finally sufficient strength to resist the wear and tear of printing"

As supports for the sensitive films, Major Waterhouse used flat sheets of copper, "grained" on one side as for engraving A glance at a card plate will illustrate what is meant by this These copper plates can be easily obtained through the nearest stationer, or, if economy be studied and large numbers be required, from any wholesale firm supplying such articles Such firms may be found enumerated in the *Stationers' Register* or other similar works of reference It is, by the way, in connection with these copper-plates that perhaps the only disadvantage of Major Waterhouse's process is to be found The plates are liable to lose their flatness, and, by consequence, it becomes difficult to insure their perfect contact with the negative under which, as will be shown, they are subsequently exposed. If the plates are thin, a strong pressure will overcome this difficulty, but, if otherwise, it is necessary to resort to other means, such as transferring the film of the negative to the sensitive surface in a bath of alcohol, or, to use a simpler method, by employing a negative transferred to or existing upon some flexible surface This point will be alluded to in discussing the various means for producing *reversed* negatives, which, it must be mentioned, are necessary in photo-collotype to produce a true reproduction of the original object.

These plates are washed with warm water, accurately levelled on the shelves of some sort of drying apparatus (that used in the preparation of gelatine plates would answer), and coated with the following mixture, which is poured on like collodion, the excess being drained off so as to leave a thin even coating on the plates Major Waterhouse, by way of evidence and example, cites the fact that half an ounce of gelatine is more than sufficient to coat four hundred and fifty square inches of surface Here is the formula for the sensitive compound

Gelatine (Nelson's Opaque)	1½ parts
Water	100 „
Bichromate of Potash	4 „
Formic Acid	1 „

The gelatine is first dissolved in the water, the bichromate added, and, when dissolved, the formic acid

The plates whilst drying should be kept protected from dust If the coating has been well applied, and the plates are flat, the film should, in a temperature of, say, 120deg Fahrenheit, dry in the course of an hour or two with an even and glossy surface

Major Waterhouse recommends that the plates should not be used quite fresh, but allowed a day or two to harden He gives as a reason for this that, owing to the weak reducing action exerted by the formic acid upon the bichromate, the film would otherwise be tender and adhere to the paper during printing in the press

Exposure of the sensitive plate under the negative is accomplished in the ordinary way, an actinometer being conveniently used to determine with accuracy its duration The plates being, comparatively speaking, of great sensitiveness, from ten to twenty minutes in the shade is sufficient for negatives of ordinary density The exposed plates should be plunged into a trough of water for about five minutes, and will then be ready for the press

Major Waterhouse recommends the vertical pressure, similar to that obtained from the Albion printing press, as being less wearing to the surface and preserving the flatness of the copper plates Full and illustrated descriptions of several kinds of printing presses may be found by the reader in "Printing for Amateurs," published at *The Bazaar* office, price 1s

The ink may be that used in lithography, thinned down with a little olive oil The roller should be preferably of glue, although ordinary lithographic rollers, or those composed of catechu as sometimes employed in typographic printing, may be used with success

When the plate is taken from the washing water, the superfluous moisture is removed with a sponge, and the ink rolled in vigorously until all the details of the picture are distinct Owing to the slightness of the relief this is an operation easily and readily performed A piece of paper is adjusted on the surface of the relief, the tympan lowered, the pressure applied, and a proof "pulled" in the ordinary way Damping and re inking must intervene between each print

The full operation of the process will be readily understood by anyone who has dabbled in either type printing or lithography, or, if this qualification is not forthcoming, by a short visit to the nearest printing office

Another collotypic process is that practised by Mr A Pumphrey, of the Camp Hill Works, Emily-street, Birmingham, in the production of his so called ink photographs In this a mixture of

Gelatine	1½ parts by weight
Bichromate of Potash (pure)	¼ part ,
Water	20 parts ,,

is spread upon a smooth surface such as glass or slate The remainder of the operations are almost identical with those given above Mr Pumphrey uses a roller either of the lithographic pattern or composed of gelatine, with a mechanical admixture of some fibrous or inert body, which reduces the "lug" or "suck" necessary in typographic printing All apparatus connected with his process may be procured from Mr Pumphrey, it being identical with his well-known autographic process for the reproduction of plans and drawings after the manner of lithography A paper free from glaze, and yet of close surface, serves as a fitting support for the picture , a medium cartridge is used, for instance, with success

Concerning the heliotype process, which is patented and worked by Messrs Edwards and Wright, of 61, Fleet-street, the collotype process of Mr Sawyer, the process of Albert of Munich, and a host of others, plentiful information may be gained by reference to the almanacs of the *Photographic News* and the *British Journal of Photography*, and elsewhere It is to be hoped, however, that the sketch given of Major Waterhouse's most excellent process will amply satisfy the requirements even of the most exacting or most backward of my readers

Photo-Engraving —I regret to say that the details which it will be in my power to give of photo engraving will hardly bear comparison, as regards completeness, with those which I have happily been in a position to lay before my readers in reference to other branches of "mechanical" photography The reason for this is that although photo-engraving, or the art of producing with the aid of photography plates similar to steel and copper plates, has attained a considerable degree of perfection, this is only met with at the cost of a great deal of labour and skill, moreover, in those cases where photo-engraving has been most successful, the ways and means adopted have remained trade secrets In spite of these unfortunate facts, I will do my best to help my readers by giving them the outlines of the practical working of, at least, one process of photo-engraving, in the hope that should any one of them feel an inclination to adopt this most charming, though difficult, branch of the art, they will have something to begin upon by way of a foundation and encouragement for success

The process about to be described is due to one of the earliest pioneers of photography, the late Mr H Fox Talbot The inventor took out two patents for it, the first in 1852, the second in 1858 After his death an account of the process was contributed by his son, Mr C H Talbot, to the English edition of Tissandier's "History and Handbook of Photography," before referred to, to which we are indebted for the following details Those desirous of having ocular demonstration of the capabilities of the process will find two specimen plates in the translation of Tissandier's book, one illustrating the reproduction of an ordinary photograph possessing half tones, the other that of a subject only made up of lines—namely, a piece of the Ordnance Survey Map of Scotland It may be said that without doubt photo-engraving lends itself more readily to the reproduction of lines than to that of half tones, although considerable success has been attained in the latter direction

The plates used for the engraving may be either of copper or of steel. The former is the more easily worked, but the latter is more durable and allows a greater number of impressions to be pulled from its surface The method of using copper plates for the etching, and of subsequently coating the surface with steel, was ultimately adopted by Mr Fox Talbot

The photograph to be reproduced should be a positive, preferably a transparency on glass, but good results have been obtained from paper photographs rendered transparent by waxing

The copper or steel plate is first well cleaned and then treated with a mixed solution of gelatine and bichromate of potash prepared according to the following directions, as given in Mr Talbot's specification of his second patent About ¼oz of gelatine is dissolved in 8oz or 10oz of water by the aid of heat To this solution is added about 1oz by measure of a saturated solution of bichromate of potash in water, and the mixture strained through a linen cloth. The proportions are variable The mixture should be kept in a dark place, where it remains good for several months, requiring only to be warmed in cold weather, when the gelatine sets to a jelly

A little of the bichromated gelatine solution is now poured on the levelled copper or steel plate and allowed to dry, either spontaneously or by the aid of heat, as in Major Waterhouse's collotype process The exposure is accomplished, as usual, by laying the photograph to be copied and the sensitised plate in an ordinary printing frame On exposure to light a negative image of a brown tint is produced

If the photograph to be copied be merely a line subject, the etching may now be proceeded with, but if it be necessary to reproduce half tones, the exigencies of practical working require a certain additional treatment of the broad shadows, which would otherwise print palely in the middle, owing to the fact that a considerable portion of the ink resting on them would be unavoidably cleaned off along with the superfluous ink which must be removed by the printer This defect is remedied by the provision of a number of minute nonprinting points (called by the inventor an "aquatint ground"), which is effected as follows A solution is made of common resin and chloroform in varying proportions A little of this is poured on the exposed plate, the result being that the solvent evaporates, and a thin film of resin and camphor forms on the gelatine surface Subsequent warming over a spirit lamp causes the camphor also to evaporate, leaving tiny particles of resin adhering to the surface of the film

The etching is accomplished as follows A saturated solution is made with the aid of heat, of peroxide of iron in muriatic or hydrochloric acid, which is strained and evaporated until considerably reduced in volume It is now stored away in conveniently sized bottles, where, as it cools, it solidifies into a brown semi-crystalline mass This preparation is called by Mr Talbot in his specification perchloride of iron When required for use three bottles are made up—No 1 of a saturated solution of this perchloride of iron in water, No 2 of a mixture of five or six parts of No 1 to one part of water, No 3 of equal parts of No 1 and water The etching is commenced by pouring a little of No 2 on the exposed plate and working the liquid over the surface with a camel's hair brush The etching should begin in about a minute, the parts etched turning dark brown or black The etching should not be allowed to proceed too rapidly, as the action requires some minutes' duration in order to give sufficient depth to the relief If the rapidity be too great, some of the No 1 saturated solution should be added, if not great enough, a little water to soften the gelatine When all the details are apparent, the operator having busily stirred the liquid the whole time with the camel's hair brush, it is wiped off with cotton, a stream of water directed on the plate, the latter wiped, and rubbed with soft whiting and water to remove the gelatine. The plate is now ready for the press

The above process of etching is modified by commencing with a small quantity of No 1, which is poured on the plate and allowed to remain for one or two minutes It does not produce any apparent effect, but hardens the gelatine When poured off it is superseded by a small quantity of No 2, which effects the etching Local faintness is remedied by application of No 3 with a camel's hair brush without removing the No 2

The rest is merely a question of steel or copper-plate printing, about which I cannot enter in detail here There are many excellent works where the subject is fully treated, a useful, though brief account is to be found in a small pamphlet published by Mr D Berri, of Holborn, in connection with his People's Printing Presses

Besides the above, there are several most excellent photo engraving processes, the details of which are secret Amongst the best known are those of Messrs J Leitch and Co, Manning and Son, Dallas, Goupil and Co, and Herr Warnerke

Photo-Lithography —The process known and extensively practised under the name of photo-lithography comprises at least three distinct operations Of these the first, and, so far as photography is concerned, the most prominent one, is the preparation of a print in fatty ink which can be transferred to a lithographic stone This print is technically called a transfer Secondly comes the process of actually "laying down," as it is called, the transfer upon the stone, and, thirdly, that of producing the final prints with the aid of a press Before going further I should inform my readers that the above operations are also to be met with in the process known as photo-zincography, which, like photo-lithography, is used for the reproduction of maps, plans, and line drawings Indeed, the method of preparing the transfer is identically the same in both processes, so for the present it is hardly necessary to particularise them Points wherein the practice of photo-zincography differs from that of photo-lithography will be noted separately

There are various methods of preparing transfers, the best known of which is that termed the Southampton method, from the fact that it is extensively used by the Government at their establishment there, where the Ordnance Survey maps and other work of great importance are produced on a large scale

A point of primary importance in all the photo-lithographic methods of working is the negative To obtain anything like good results a means of intensification should be adopted which will give perfect transparency for the lines of the map, plan, or drawing to be reproduced, and perfect opacity to represent the whites of the paper The negative should be on glass having a very level surface, owing to the great pressure which it will have to undergo in the printing frame

The transfer paper is prepared as follows —A good sample of thin paper ("bank-post" is recommended) is selected and cut into pieces a little larger all round than the negative to be employed These are floated over a warm solution of Nelson's fine cut gelatine, one part to seventeen parts of water, for three minutes, after which they are hung up to dry away from all dust When dry, they are again floated over the warm solution and hung up by different corners than those by which they were first suspended When dry a second time they may be sensitised for one minute in a cold solution of bichromate of potash, one part to fifteen parts of water Finally, they are passed through a lithographic or copper-plate press to level their surfaces When sensitised the paper will keep a day in hot weather, a week in cold

Exposure is carried on until the picture appears as one made up of dark reddish brown lines on a yellow ground

The next step is to apply the necessary coating of fatty ink The following formula, as used at Southampton, is given by Captain Abney in his "Instruction in Photography"

Lithographic printing ink	8oz
Middle varnish	1oz
Burgundy pitch	3oz
Palm oil	½oz
Wax	½oz
Bitumen	1oz

The ink is first ground with the varnish on a stone slab The Burgundy pitch is melted over a clear fire to rid it of the water, the wax added in small pieces, and lastly the oil When properly melted these should ignite, the bitumen may now be added, and the whole ignited again The ink and varnish are now stirred in, the pot removed, and the contents, when cooled, poured into tins If the ink is too hard more palm oil should be added

To coat the exposed paper with this ink, a small quantity of the latter is worked into a very fine layer on a lithographic stone, sufficient turpentine being added to give it the consistency of honey A print is laid face downwards on the inked stone, and the whole passed once or twice through the press

The print being removed from the stone, and found to have been properly inked, is floated face upwards on water at about 90deg, until the lines are in distinct relief. It is next transferred to a glass plate, which must be placed in a sloping position to receive a gentle, but constant stream of water at about 150degs Whilst this stream is going on the soluble gelatine is tenderly removed with a very soft sponge. If it refuses to part it is recommended that the prints be soaked in warmer water for about an hour and the sponge again applied When the sponging is complete the prints must be well washed in cold water and hung up to dry They should be preferably, but not necessarily, left a day before being actually transferred to zinc or stone

Besides the above there are two other methods of preparing transfers which deserve notice, and for particulars of which we can at least refer our readers to the best of all sources, namely, the inventors' own descriptions The first of these is one called papyrotype, and patented by Captain Abney, R E, who gives full working details in his "Instruction in Photography" Another method is advocated by Mr A Pumphrey, of Birmingham, already mentioned in connection with his collographic process, who contributed a paper on the subject to the *Photographic News Almanac* of 1879 Readers will also find a valuable paper on modern photo-lithography in the *Photographic News* for 12th March, 1880

The transfer having been satisfactorily prepared, it next remains to make ready the stone for its reception Doubtless most of my readers are familiar with the appearance of lithographic stones, it will be enough to mention that they are of a calcareous nature, very fine and compact, and that although they are to be found in various other parts of the world, the best qualities are imported from the quarries of Bavaria They may be easily obtained at low prices from any manufacturer of printing materials, as, for instance, Messrs Reed and Fox, of the Fann-street Foundry, Aldersgate-street, London, E C As imported, the stones have but a rough surface, which requires further grinding and polishing before use, and, in the case of small stones, such as those to which my readers will probably be limited, is effected by the simple plan of rubbing together by hand the faces of two stones, with silver sand and water between them The sand should be sifted and the water perfectly clean During the grinding the stones should be transposed, the top one taking the place of the lower, and grinding should be continued until the surface has been proved by a metal straight edge to be exactly level To *polish* the stone all grit is removed with a sponge, and the grain caused by the sand destroyed by passing over the surface a piece of soft pumice stone with plenty of water After a second washing a similar operation is gone through with water Ayr-stone (snake-stone), which is applied until great smoothness of surface is obtained. The whole operation of polishing will take half an hour or less For erasing an old subject the same system of grinding and polishing as described above may be adopted

Before proceeding to the actual transfer to the stone, it must be premised that the operator has possessed himself of a suitable press A new lithographic press, with side lever action, and a bed of 14in by 21in, costs at Reed and Fox's 11 guineas This price does not include tympan, leather, and boxwood scrapers, which involve a comparatively trifling extra expenditure It will be understood that this machine is one of first-class make, capable of producing any kind of work Cheaper presses can be procured, such as Waterlow's or Berri's People's Printing Press, the latter of which is particularly recommended to photo mechanical workers as being adapted to type, copper plate, and lithographic printing alike Mr D G Berri's press is made entirely of metal, and the pressure is obtained by means of a roller which can be altered to suit the impression The following are the first three sizes of the People's Printing Press, which with all materials can be obtained of the maker, 36, High Holborn No 1, prints a surface 4½in by 5in , £1 15s , No 2, prints 7in by 5½in , £2 18s , No. 3, prints 9¼in by 6¾in , £3 18s 6d

To effect the transfer, a well polished, dry stone is slightly warmed (either by holding it before the fire or by pouring boiling water over the surface and allowing the moisture to evaporate), dusted, and adjusted in the bed of the press A clean piece of paper is laid on the surface, the tympan lowered, and the whole passed under the press or roller to adjust the pressure, or, as it is technically called, the "pinch" This must be ascertained to be correct all over the stone, and, if necessary, rectified by inserting pieces of paper between it and the bed Now pass the stone two or three times through the press from end to end, so as to cause a still more perfect equalisation of pressure The transfer is now laid face downwards on a piece of blotting paper, and the back carefully damped with a moist sponge It is then taken up by two corners and laid on the stone, a sheet or two of clean paper superposed, the tympan gently lowered, and the whole passed through the press three or four times, the pressure being very slightly increased each time The tympan is now raised, and the condition of the transfer inspected If it adheres closely and evenly to the stone, it is again slightly damped on the back and passed through the press as before This done the tympan may be raised, and the transfer soaked to remove it from the stone The picture should now be found perfectly transferred in all its details When dry it should be gummed all over its surface with dilute gum arabic

At this point the functions of photography end, and what remains is simple lithography Concomitantly my detailed instructions must end, as this does not happen to be a manual of lithography. At the same time I think a slight *résumé* of the succeeding operations may lend completeness to the present sketch of photo-lithography, and cause it to be more intelligible to those who are not technically familiar with lithography pure and simple The following, then, is a skeleton sketch of what a lithographer would do with a stone to which, by the aid of photography, a picture had been transferred as above described and explained To begin with, the gum is washed off the stone, and the picture a second time inked in with ordinary lithographic ink, just as it was before the transfer was effected This is done whilst the stone is still damp, as the action of lithography throughout depends on the repellence of water by the greasy ink, and, secondly, on the affinity of the greasy ink on the roller with that already on the picture To prevent the lines spreading the stone is now etched with very dilute nitric acid Damping and slight gumming again follow, then damping and inking An impression may now be pulled and the work proceeded with, damping and inking intervening between each impression

To those wishing to study the practice of lithography through the medium of a full and reliable manual, I may recommend "Instructions in the Art of Lithography," by C Straker, price 7s 6d (London Benjamin Winstone, 100, Shoe lane, E C), or D G Berri's "Book on the Art of Lithography," price 1s 6d

Photo-Zincography —Before receiving a transfer, a zinc plate, which can be obtained ready planished, should be grained by working brass founders' moulding sand (sifted) over the surface with a piece of zinc, the edges of which should be bent round a block or cork to prevent scratches The "mulling," as it is called, should be continued until the surface of the zinc plate is of a dull grey colour, and it should be performed immediately before the transfer is effected To accomplish this latter operation the zinc plate is screwed on to a planed block of wood to give it a height suitable for working in the press The transfer being effected, the zinc plate is well washed and fanned dry Captain Abney gives the following details for the succeeding operations A decoction of galls is made by soaking 1oz of bruised Aleppo galls in three quarts of cold water for twenty-four hours, the mixture is then boiled and strained A small quantity of phosphoric acid is also prepared by placing sticks of phosphorus in a bottle of water, the ends of the sticks being exposed to the air The following formula is then followed

ETCHING SOLUTION

Decoction of galls	1qt
Gum water	1qts
Phosphoric acid.	3oz

This is brushed over the plate with a broad brush and allowed to act for a few seconds, the plate is now wiped and again fanned dry Washing and inking follow as in photo-lithography.

Photo Typography —I have already remarked, in alluding to phototypography, that in all probability such progress as yet remains in store, at any rate for mechanical photography, will tend to the improvement of this most important and useful branch of the art Unfortunately, this theory implies, what is indisputably the fact, that photo-typography is at present in by no means a very advanced state Still, I venture to think I can see my way to furnishing my readers with particulars and hints which, at any rate, will be sufficiently practical to show what photo typography really is, and possibly to indicate the direction in which some advance on existing methods may be made by some intelligent reader with time, brains, and perseverance at his disposal

To begin with, let us consider the object of photo-typography and the appearance of a photo-typographic block Probably most of my readers are familiar with the appearance of the wood blocks ordinarily printed with letterpress They are doubtless aware that a woodcut is made up of lines of various thicknesses in relief, that by the action of the inking roller these lines in relief are inked in, and that a proof is obtained by superposing a piece of paper and passing it with the block through the press By this it will be understood that in relief blocks, such as those used in wood engraving and photo-typography, the reliefs represent the shades of the picture, the sunken portions the lights Hence the object of photo-typography is to provide a block in relief in exact reverse to photo engraving, where the sunken portions of the plate represent the pictorial lights

And this leads us to another and most prominent stage in our work This is the variety in the class of reproduction which photo-typography may be called upon to execute Broadly speaking, the variety consists of two kinds, namely, the reproduction of drawings in line, and the reproduction of nature in half tone Of these the first is in a comparatively advanced stage in spite of the difficulties attendant on its practice, but photo-typographic blocks of subjects in half tone are absolutely rarely met with in any degree of excellence, while such as have been produced are the result of operations which are trade secrets, and so more objects of admiration than of intelligent and practical interest The reason for this is the difficulty experienced in adapting the large expanses of comparatively unbroken relief which are met with in half tone blocks to the exigencies of letterpress printing, which requires something all over the block to hold the ink, as in an ordinary woodcut Before discussing the question of surmounting this difficulty it will be well to give some slight sketch of the reproduction of subjects in line by photo-typography, as, though this falls short of the other, it is still a step in the right direction, and may be looked on as a safe basis to begin upon

One plan of making relief blocks, which may be found mentioned in Captain Abney's "Treatise on Photography," is to coat a steel, copper, or zinc plate (preferably one of the two former) with a thin coating of asphaltum or bitumen of Judæa This is exposed under a negative, and the remaining soluble portions of the film removed by a solvent The relief is now produced by the action of a mordant The whole process is a difficult one, and the results often unsatisfactory, by reason of the fact that the help of the saw or graver has to be called in to make the plate workable

A simpler, and what seems to me a more practicable, method is the following, which was published two or three years back in an American journal, the *St Louis Practical Photographer* I give it as it was there given under the impression that it contains, at any rate, a correct principle, and one which is as simple as it is ingenious The process, which is called photo-stereotyping, is as follows A sheet of plate glass is coated with a solution made by dissolving 1oz of bichromate of potash in 15oz of water, warming gradually, then adding two ounces of fine gelatine, and filtering through linen at boiling heat The sensitised plate is exposed under a *positive* in diffused light for from ten to thirty minutes It is then taken into the dark room and washed with water for five or ten minutes, till the relief is wholly developed, after which it is dried with filtered paper and coated with glycerine by means of a camel's hair pencil, the excess of liquid being removed with filter paper From the relief plate thus prepared a cast is made in plaster of Paris of the thickness or consistency of oil, and from the plaster cast thus made a metal one may be taken in the same manner as that in common use among stereotypers of letterpress

I believe I am right in stating that at least one firm in London employs a process similar to the above, and obtains very good results, as may be seen in some illustrations which have appeared in *The Bazaar* and other serial publications and books

I am sorry not to be in a position to supplement the above details with any practical information concerning the production of half tone blocks, but I should like to record my conviction that the above process of photo-stereotyping seems to me to be more likely a step in the right direction than the more complicated method first alluded to What is wanted is to give a grain or some other means of holding the ink to the surface of the reliefs Possibly some modification of an idea utilised by Woodbury in kindred circumstances will be eventually found successful. This was to mix with the gelatine a fine powder, such as emery, which to some extent caught and held the ink as it was spread by the roller over the surface of the plate I am myself much interested in the solution of the problem, and trust one day to be in a position to make public the result of experiments which theoretically, at any rate, are distinctly promising

Woodburytype —Of all photo-mechanical processes, perhaps Woodbury type may be looked on as the most remarkable, and, in some respects, the most successful Although the actual operation of printing is quite mechanical, and completely independent of such consideration as light and such supplementary aid as the toning bath, the results of the process are undistinguishable, except by an expert, from the best of silver prints In fact, in many cases a Woodburytype possesses a delicacy of detail unrivalled by the more unstable (for the Woodburytype is permanent) print in silver It may be mentioned that the process has been largely used for illustrating newspapers and books , indeed, a great number of the portraits sold in shops are produced by its aid

The working of the process has very recently undergone a distinct and important change Mr Woodbury's patent, which was, and is, worked by the Woodburytype Company under the able management of Mr Fry, has expired, and the process is now free to the public Again, important modifications have been introduced, enabling it to be practised conveniently by almost anyone, which was certainly not the case formerly. But the novelty of these modifications unfortunately precludes the possibility of giving such full and detailed instructions as might be desired The fact is that Mr Woodbury, to whom the first, if not the second, step in these modifications is due, went over to France, and there, we understand, entered into some arrangement not to give instructions in relief printing in this country However, the following ought to be sufficient for the intelligent photographer who has studied the preceding sections, while he will probably, at no distant period, have a complete manual of reference in "Woodburytype the Old and the New," a work which has been promised us by M Leon Vidal, the French photographer and correspondent of the *Photographic News*

To begin with, I must give a *résumé* of the process as it was worked until a few weeks ago The first stage was the preparation of a fairly substantial pellicle of gelatine very slightly tinted, but still transparent This was sensitised with bichromate of potash, exposed under a negative, and washed to remove the soluble gelatine, as in the collotype processes The result was, of course, an intaglio or image represented by hollows more or less deep This intaglio was now pressed into a sheet of lead by being laid on a perfectly flat and true steel tray, the walls of which were knife edges, superposed with the leaden sheet, and then subjected to the pressure of a hydraulic engine. The result of this pressure (which was truly enormous—something like a strain of 150 tons being required for a carte de-visite picture) was the production of a mould in lead, the knife edges allowing the latter to fill up the tray precisely, and thus preventing injury to the gelatine mould, which could, strange to say, be used over and over again

This formed what may be termed the first portion of the process But the old order, which has yielded place to a new, had considerable drawbacks, centred around the use of the hydraulic press This was a formidable piece of machinery, particularly as regards the first cost, whilst the exigencies of pressure were so great that Woodburytypes of dimensions greater than 14in were seldom if ever produced But recent modifications have entirely done away with the necessity for this troublesome machinery All that is now required is a rolling press and a supply of tinfoil The intaglio is prepared as before, the composition of the pellicle being, I believe,

Nelson's Gelatine	200 parts
Water	100 ,
Glycerine	20 ,,
White Sugar	30 ,,

to which is added a little Indian ink to give it a tinge of colour This, being sensitised, is exposed not under a negative, but a positive It is attached to patent plate glass, and developed as before Now comes the real improvement, which consists simply in placing a sheet of tinfoil upon the gelatine mould, and passing both through a rolling press The result is that the tinfoil is forced into every hollow of the gelatine, thus, in fact, lining it with thin sheet lead, and rendering it equivalent to the leaden mould as produced with the expensive and troublesome aid of the hydraulic press

The remainder of the process is equally simple and ingenious The intaglio is slightly greased and placed in position on the bed of a press A pool of warm ink, formed by adding a fine pigment or permanent dye to a solution of gelatine in hot water, is poured on to the mould A piece of paper, strongly sized and of close even texture, is placed on the inked mould, and the top plate of the press, which is hinged, is brought down and secured by a catch The result of this is to squeeze out the superfluous gelatine, and when time has been given for the ink to set on the paper, which it does in gradations corresponding to that of the mould, the top plate is unlocked and raised, and the print removed Another pool of ink is poured on to the mould, and the operations repeated, each print being treated with a solution of alum to render the image insoluble

It is an important point that the top plate, which in the pattern press used for producing this class of work is of glass, should be perfectly level.

It may be easily understood that this press may be dispensed with by merely super-posing a thick piece of plate upon the back of the paper laid upon the inked mould, and by this means the ink would be properly squeezed out, supposing the picture to be of small dimensions. It has been said that, in later modifications of the process, the mould has a level support in the shape of a glass plate to which the pellicle adheres, and which obviates the necessity for any bed for it to rest upon.

Excepting that it is difficult to reproduce any large expanse of pure white, and that the prints require mounts and cannot be produced along with type in any ordinary typography, Woodburytype, particularly as regards excellence of results, may be looked upon as the most successful of existing photo mechanical processes.

CHAPTER V.

Reversed Negatives

More than once, in connection with the single transfer carbon and the collotype process, for example, the necessity for a reversed negative has been alluded to As any interpolated account of the methods employed in securing reversed negatives would have injured the continuity of my descriptions of the processes named, I have preferred to postpone such account until I could give it a distinct chapter to itself With this apology, I will now proceed, first, to explain what a reversed negative really is, and, secondly, its mode of production To use a simple metaphor, a reversed negative is to an ordinary negative what the image of an object in a mirror is to the object itself It is a reversal of the composition of an ordinary negative, by which the left becomes the right, and so on

There are several ways of securing a reversed negative all more or less efficacious, but not equally convenient The oldest method is that of providing the negative (which should be unvarnished) with a layer of gelatine, collodion, or gutta percha, and then stripping the film bodily off the plate By printing from the side which formerly adhered to the plate, the results accruing from the use of a reversed negative are manifestly obtained The following *modus operandi* is said to be the best of those which are based upon the above principle The unvarnished negative is first coated with a solution of indiarubber in benzole, one to two grains to the ounce, which is allowed to dry It is then flowed with a transfer collodion, for which this formula is recommended

Transfer Collodion

Ether	5oz
Alcohol 805	10oz.
Castor oil	½oz
Pyroxyline	¼oz

This is allowed to dry The plate is then immersed in cold water, and if the film does not begin to appear loose in a few minutes an ounce of sulphuric acid to a gallon of water should be added to hasten this result. Whilst still immersed, the edges of the film are run round with a penknife and the film itself gently detached from the glass The film may now be reversed, laid on a clean plate, and, on withdrawal from the water, gently squeezed on to it The above method, which is suitable for collodion negatives, has the disadvantage that the thin film is rather a tender object which, unless the manipulation is very delicate, stands a good chance of being rent in the operation of transfer

Another method consists in the employment of an instrument known as the reversing mirror An improved form of this is one manufactured by the Autotype Company, who use a surface of perfectly level plate glass, upon which has been deposited a coating of pure silver This is set at an angle of 45deg in a box fitting on to the front of the camera, the method of arrangement and fitting adopted by the Autotype Company being such that a mirror for any given size of lens may be adapted for use with any lenses of smaller calibre In taking views, portraits, &c the camera is turned sideways to the object, the resulting negative thus fulfilling, through the intermediate reflection of the sloped mirror, the necessary conditions of reversal The advantages claimed for the reversing mirror may be said to rest chiefly upon its employment for copying purposes, where the engraving, drawing, or other object to be copied may be simply laid on the floor instead of being necessarily placed in a vertical position Of course the mirror has in these cases to be placed so as to look down on the object A happy result of this is that the illumination being vertical there is a remarkable absence of texture or grain Again, great relief may be obtained with medallions or other objects requiring strong light and shade by covering over the top of the camera and using only a side light

A third plan, known as the "nitric acid process," is a very neat and, if properly carried out, a successful one Under any negative of which it is desired to have a reversed representative is exposed a plate containing preferably only silver bromide (chloride being admissable, but not iodide), as, for instance, a collodio-bromide dry plate This is developed with alkaline pyro or ferrous oxalate, and well washed The plate is now fastened on to a pneumatic holder, and a little of the best and purest nitric acid flowed over it The result is a picture in which clear glass represents the deepest shadows, and so on This is now exposed for a second or two to daylight, or for a longer period to the light of a lamp, and on returning to the dark room is again treated with the developer, alkaline pyro, or ferrous oxalate, as the case may be. This causes the image to darken until a negative (reversed) of the ordinary description is obtained. The disadvantage of the above method consists in the difficulty experienced in keeping the film on the plate after the application of the nitric acid. A simple cure has been suggested by Mr. Edward Viles, whose article on the subject of making transparencies by this process is well worth reading. That gentleman simply draws a tallow candle all round the edges of the dry plate before it has been wetted in any way, so as to leave a greasy margin of about ¼ in. This water-repelling edge is recommended to all who are troubled with slipping films.

For an account of two processes of more recent introduction than those already enumerated, I am indebted to the *British Journal of Photography*. The first of these is due to Mr. Thomas Bolas, F.C.S., whose Cantor lecture on photo-mechanical processes, published in the *British Journal*, is entitled to all possible respect. His method consists in treating an ordinary gelatino-bromide dry plate with a solution of bichromate of potash, and exposing it under a negative for the same period as that required for a carbon print. On developement by alkaline pyro or ferrous oxalate, a reverse negative results. An advantage of this method is that dry plates which have been accidentally exposed to the light may be used; even those which have been developed need not be discarded, the image being removed by means of a solution of bromine in water and the plate washed before the application of the bichromate of potash.

The last method I shall mention is one introduced by Mr. W. Brooks, of which a favourable opinion has been recorded. In operation it resembles the nitric acid process, a film containing only bromide of silver (collodion by preference, although gelatine may be used with careful treatment) is exposed under a negative and developed. The image is now treated with a solution of iodine in alcohol (the ordinary tincture of iodine of the Pharmacopœia diluted with half its bulk of water may be used) until, so far as reflected light is concerned, the image quite disappears. An exposure of a second or two to the light now follows, then a second application of the developer, which produces the desired result of a reversed image of standard quality.

CHAPTER VI

TRANSPARENCIES.

THE ability to produce at will a good transparency is of no small importance to the photographer. In the first place transparencies are of great practical utility, of which the multiplication of negatives, and, above all, the production of enlargements, are prominent instances Again, they may be looked on as important additions to what may be termed the ornamental side of photography There are a thousand and one pretty uses to which they can be applied To begin with, a simple transparency, backed with some translucent substance, such as ground glass, or coated on its silver side with a saturated solution of white wax in ether, to each ounce of which after filtration another ounce of ether has been added, forms in itself no unattractive ornament But a very limited ingenuity will rapidly enlarge upon this, and "storied windows richly dight," not to mention lamp shades, and screens of many descriptions may easily become accomplished facts in the house of the tasteful photographer. Lastly, there is a use for transparencies which is both of a practical nature and furnishes considerable amusement at no great expense of trouble, money, or time I am alluding to the production of photographic slides for what has been for many years known by the unfortunate name of the magic lantern

Amongst the various methods of making transparencies, perhaps the first to be mentioned is that in which a special copying camera or some kindred contrivance is required Into this I shall not go in detail, as, in my opinion, the method is quite superseded by others more new, which are less complicated and quite as efficient. The processes which I shall describe are so simple that they may be practised by anyone; moreover, they require little, if any, special apparatus, while giving the best possible results.

To begin with, I will again revert to the nitric acid method, which I alluded to in the preceding chapter on Reversed Negatives. In the case of transparencies, the mode of procedure is naturally different.

Instead of recourse being had to a negative, the transparency is a direct one, that is to say, taken from the object at one operation. A collodio-bromide plate is used, and exposed about one third longer than would be necessary for a good negative. Developement (which must be pushed much further than in the case of an ordinary negative) follows, then the washing, the application of the nitric acid, and the other operations as previously detailed. The most important point is, perhaps, the correctness of the exposure, which, while full, should not be overdone. In the second application of the developer, the latter can be weakened and rendered more under control, if desired, by the addition of a little water. If, after all, density is wanting, the plate may be floated with a saturated solution of copper chloride, to which an equal bulk of water has been added. This causes the transparency first to assume a brown tone (which may be preserved, if the picture is already dense enough, by simply washing off the solution), next to whiten until the image almost disappears, when the alkaline developer may again be applied to bring out the picture. The advantages of the nitric acid method are that the operation is direct, and that, partly from this reason, partly from the merits of the process, the pictures possess extreme delicacy, rendering them of peculiar utility for the production of enlargements and for employment as slides in the optical lantern. Perhaps the only apparent disadvantage is but an advantage looked at from a different point of view. The process being a direct one, it is not possible to utilise old negatives. Again, in cases of transparencies of large dimensions, the manipulation would become difficult to a prohibitory extent.

The next means of making transparencies is a very simple one, and will especially commend itself to dry plate workers, both in collodion and gelatine. A dry plate is placed under an ordinary negative in a common printing frame. The exposure to daylight in the case of a moderately sensitive plate should hardly exceed a second, but it is preferable to expose it for a proportionately longer period to the light of a lamp constructed on any of the better known principles. After a few trials the exposure may be ascertained with extreme accuracy, and a great number of transparencies obtained in the course of a single evening. Developement naturally follows, and if ferrous oxalate be used, no toning will be necessary, otherwise, the picture may be toned by immersion in the following:

TONING SOLUTION

Chloride of gold	1gr
Hydrochloric acid	6 drops
Water	10oz.

A third transparency process is taken from carbon printing, and is, perhaps, the simplest and most likely to be adopted of all. A glance at that portion of the chapter on carbon printing where double transfer comes under notice, will explain the method fully and perfectly A piece of sensitive tissue is exposed under a negative, and transferred to a waxed or chalked glass plate Developement in hot water follows, the tissue being stripped off, and the transparency all ready toned remaining The fixation in alum may be carried out as a precaution

Lastly, most exquisite transparencies may be secured by Woodbury-type, glass being used instead of paper as the final support Amateurs may, perhaps, not incline to this method, but a glance at the magnificent series of slides produced by it, and published by the Sciopticon Company, of 157B, Great Portland-street, W , will convince them of the capabilities of the process for this branch of work

The consideration of transparencies leads to the very simple means by which a negative may be reproduced almost to infinity The method should be obvious from the original negative is taken a transparency The exposure of a dry plate under this of course results in a negative

CHAPTER VII.

PHOTOGRAPHY BY ARTIFICIAL LIGHT.

FEW will deny that a peculiar interest is attached to the question of photography by artificial light Be it midday or midnight, a portrait can always be taken by its aid, provided the appliances are correctly adjusted and administered, and what is even more important, the exposure is small beside the exposures often rendered necessary by the use of the wet collodion under ordinary circumstances, while the results are all that can be desired Witness the pictures turned out with the aid of the electric light by Van der Weyde and the Stereoscopic Company, both of Regent-street Moreover, the quality of light being uniform, it needs but a few experimental trials to arrive at uniform correctness of exposure, one of the secrets of success in portraiture as in every other branch of photography

The Electric Light —Amongst the various kinds of artificial light that may be used in connection with photography, the most prominent is that obtained by means of electricity, which will, perhaps, be best understood by an inspection of some such pattern establishments as the two before referred to, where the electric light lends its aid to the production of portraits rivalling the best work done in ordinary daylight. In one of these the light is produced by two of Siemens' dynamo-electric machines, one capable of producing a light equal to 6000 candles, the other a light equal to 2000 candles These are worked by an eight horse power silent gas engine, costing about £250 The dynamo-electric machines may be put down at about £200 The above are in the cellar, while connected with them, by large conducting wires of copper, is an electric lamp with the usual carbon pencils, which stands in the studio upstairs, and the light from which is reflected on to the sitter by a large concave reflector lined with enamelled paper The total cost of the whole apparatus may be put down at about £700. Of course such a price as this is, except in rare cases, prohibitory, but the above details are quoted to give a general idea of arrangements which, perhaps, as nearly approximate to perfection in this particular branch as any in existence It must be understood that by far the best, if by far the most expensive, method of producing the electric light is that in which, as in the studios cited, the dynamo-electric machine is brought into use, and when the quality of the light, and the ease with which the whole apparatus can be started at a moment's notice, are brought into consideration, cases will be readily imagined when a price quite prohibitory to the ordinary amateur might be profitably approached by the enterprising professional

But, as every reader to whom electricity has been ever so limited a study should know, there is another, and, so far as expense is concerned, a vastly less formidable means of producing the electric light besides that of which an outline has been given This is the voltaic battery, familiar to many through the toy electric lamps sold for a shilling or two, in which a light is obtained with a tiny battery contained in a jampot or other kindred contrivance I will assume it to be a well-known fact that the light may be increased in power by multiplying the elements of a battery, that is to say, by using forty or fifty "Bunsen's" or "Grove's" cells instead of one I do not think, moreover, that I need enter into the detailed construction of the separate elements of a battery, as that is a point which belongs to the department of electricity, and does not lie within the scope of the present work But I should like to recommend my readers to a quarter in which, perhaps, more reliable and practical information can be obtained concerning the application of electric light to the specific purposes of photography than can be found in any existing manual I speak of a series of articles contributed during January, February, and March, 1879, by Mr G F Williams, a practical electrician of many years' standing, to the *British Journal of Photography* Again, I think that, perhaps, even to readers who are acquainted with the subject, a few words "by the way" may not be unacceptable Firstly, I cannot do better than illustrate the principles involved in voltaic electricity by the following simple explanation given by the writer mentioned above In a battery jar (for which one of the jars used for table salt may well be employed) is placed a plate of amalgamated zinc in diluted sulphuric acid, little or no action is visible In the same jar is placed a "porous cell," containing either a piece of platinum foil or a plate of gas carbon, and nearly filled with the strongest nitric acid If the platinum foil be used, we have Grove's battery, if carbon, Bunsen's modification of it Now connect the zinc with the carbon or platinum by a wire, and a brisk chemical action ensues If a short wire be attached to the zinc and another to the carbon, and their ends rubbed together, a spark will be seen every time the contact is made or broken. This is *current* electricity.

To pass on to the actual provision of a battery capable of producing sufficient light for purposes of portraiture, I am indebted again to Mr Williams for the following very practical information relative to the materials necessary for the construction of a battery, and their cost In his series Mr Williams describes six types of battery which should be suitable to the requirements of every photographer Of these the most expensive is one consisting of fifty cells, square form, Grove's, 7¼in by 4¾in by 2¼in inside, platinum being used instead of carbon This costs about £20, while to charge it costs 12s The cheapest on the other hand is one consisting of fifty cells, square form, Bunsen's, 5⅜in by 3⅜in by 2in inside, costing but little over £6, the charge coming to 6s 3d extra It may also be useful for the inexperienced to know that battery jars and porous cells can be obtained advantageously from Messrs Stiff, Lambeth, S E , zinc from Braby and Co , or Treggon and Co , London , carbon blocks and plates from Thorpe and Hancock, Howard-street, Wandsworth road, S W (wholesale) , brass clamps, from Davis and Timmens, Bowling Green-lane, Farringdon road, E C (wholesale) , platinum, from Johnson, Matthey, and Co , Hatton garden, E C , acids, from Pass and Boome, Weston-street, Bow Common, E

As regards the lamp, the photographer must be left to his own discretion It may be mentioned that Siemens' automatic lamp costs £15, Serrin's, £14 but these are very perfect instruments indeed Strictly speaking, the photographer does not absolutely need a lamp, as the light only being required for a few seconds, any simple contrivance for holding the carbon pencils will be sufficient

It is recommended that, if possible, the battery should be kept in an out-house by itself, to facilitate the renewal of its charge, and to lessen the annoyance of the fumes arising from the acid Connection may be made between the cells and the lamp by strong gutta percha-covered copper wire

As regards the lighting of the object, good results have been obtained by placing the lamp about 5ft from the floor and somewhat in advance of the sitter A screen of *papier mineral* is interposed, and a reflector used on the shaded side

In conclusion it should be remarked that to avoid the unpleasantness of the nitric acid fumes it has been suggested by Mr J W Swan to employ an acidified bichromate of potash solution instead of the zinc and carbon combination This, with various arrangements calculated to lessen the trouble of constantly attending to the battery, will be found entered into at length by Mr Swan in pp 129—132 of the "Year Book Photography" for 1879.

Pyrotechnic Lights —It has long been a well-known fact that considerable actinic properties may be found to exist in the light obtained by igniting compounds similar to those commonly used in the manufacture of fireworks But the employment of these pyrotechnic compounds is attended with much inconvenience by reason of the fumes arising on their ignition Again, it would hardly be possible to secure a satisfactory portrait by merely lighting a certain quantity of an actinic fire in the neighbourhood of the sitter Some system of reflection must be used to concentrate the rays, and so to harmonise the lighting Hence it becomes necessary in working with a pyrotechnic compound to do so in connection with some sort of special apparatus calculated to show the light off to its greatest possible advantage, and furthermore to carry away the obnoxious fumes Various patterns of apparatus have been devised with these ends in view, all more or less successful The earliest of these was the Photogen of Mr John Moule, which we believe can still be obtained from Solomon, of 22, Red Lion-square, for £5 10s The Photogen consists simply of a huge white-lined reflector, in the centre of which is an arrangement for supporting the compound, which is fired by hand, the smoke being carried away by a chimney A more pretentious instrument, constructed on a not very different principle, is the modern Luxograph In this the light is softened by being transmitted through some such medium as tissue paper The Luxograph has been patented by Messrs Alder and Clarke, from whom all particulars can be obtained, at 9, West Strand, S W The total cost of the apparatus complete, with every fitting needful to take any sized portrait from carte de visite up to 24in. by 18in , either bust, head, or half length, is £35 If it be required to take full length or three-quarter figures, a larger apparatus, costing £50, is recommended With these sums is included the licence to work under the patent The cost for exposure, with a rapid gelatine plate, is under a penny The instrument can be viewed at the studio, 9, West Strand, and special demonstrations are occasionally given for the benefit of photographers generally

An apparatus which, I think, is destined to enjoy far greater popularity than the foregoing, while hardly, if at all, inferior to them in the character of its results, is one the introduction of which is due to Mr. R V Harman, of Bromley, Kent From the following simple description any person of average intelligence should be able to construct one for himself, which will suit every purpose of ordinary portraiture, but it should be mentioned that a well-made instrument of metal, complete with trivet and saucer, may be obtained from Mr Harman himself at the extremely moderate cost of 25s The construction of the apparatus is essentially as follows Imagine an ordinary deal case of cubical form, measuring about 2ft. 6in every way Now, suppose this cut in halves, diagonally Take one half and rear it up on end, cutting a hole in the top for the chimney, and covering over the open front with tissue paper, excepting a space of about six inches from the bottom, which serves the double purpose of allowing the composition to be easily fired, and of creating the necessary draught The piping for the chimney may be made of cardboard bent round, and pasted paper, and may be let out into the open air through a window, roof, or chimney breast The instrument itself may be placed about three feet from the floor, and a little in advance of the sitter, a screen covered with white paper serving as a reflector on the shaded side A trivet stands on the floor of the instrument, and supports a saucer filled with dry sand A sufficient quantity of the compound (which will necessarily depend on the rapidity of the plates used) is taken in a wineglass and emptied in a pyramidal heap on the sand When ready to expose, a vesuvian or pipe-light is dropped into the centre of the mixture

The following is the formula for a pyrotechnic compound, given me by Mr Harman, with directions for its preparation

PYROTECHNIC COMPOUND

Nitrate of Potass	1½ lb
Flour Sulphur	½lb
Sulphide of Antimony (black)	1oz
Ground Charcoal	½oz
Camphor	1oz

Break the camphor up small and dissolve it in about 3oz or 4oz. of methylated spirit in a basin When dissolved, stir into it some of the powder, a small quantity at a time, until it becomes stiff, and then thoroughly mix the whole together

Keep the above, when not in use, in a tin or box in a dry place, as damp will considerably affect it

I give a second formula, proposed by Mr J Barker, in the "Year Book of Photography" for 1880

Nitrate of Potass	20 parts
Sulphur	8 ,,
Sulphide of Antimony	4 ,,
Loaf sugar	4 ,,

If extra rapidity of exposure be desired, add about half a part of magnesium. The ingredients should all be powdered separately, then mixed and strained through a hair sieve, as care is necessary when mixing sulphur with potass

Magnesium Ribbon — At first sight the employment of magnesium ribbon in portraiture by artificial light seems to offer no practical obstacle whatever. The light itself obtained from this source, as everyone knows, is of surpassing brilliancy and whiteness, while the ribbon seems so cleanly and so handy that by its side the electric light with its troublesome paraphernalia and pyrotechnic compounds, with all the nuisances attendant on their preparation and combustion, seems to have no chance Moreover, the ribbon can hardly be said to be expensive when we consider that its present price is about 12s the ounce, and looking at the number of yards contained in that quantity, a number which must be seen to be believed But magnesium ribbon has the drawback of being not quite so easily combusted as some would imagine It is all very well to break off an inch and deliberately expose it to the action of flame until it fires, but it is quite another thing to manipulate it in such a way as to render it efficacious in portraiture To begin with, one single strand of ribbon hardly gives sufficient light except with a prolonged exposure, and to keep a single strand equally alight for even a few seconds, the necessary reflector being taken into consideration, requires, if not an assistant, at least much dexterity and care Several contrivances have been suggested, whereby as many as twenty strands of magnesium ribbon could be ignited at once, but they are hardly so simple and practicable as might be wished Perhaps the only way of working the ribbon with any success, combined with comfort, is to employ one, or, better, two of the well-known magnesium lamps These have in their interior a roll of the ribbon which is paid out by a neat clock-work arrangement, as it is gradually combusted The speed is regulated by two small fans enclosed in a cap at the top of the clock-work, the general rate of burning being about one foot per minute Magnesium lamps can be obtained from the patentee, Mr J Solomon, of 22, Red Lion-square A No 1 lamp, with silver reflector, costs £2, the rollers, with adjustment, 10s

Gas Light —That ordinary gaslight may be successfully adapted to purposes of portraiture has been proved by Mr P E Laws, of Newcastle-on-Tyne Much credit is due to this gentleman, not only for the originality of his idea and the painstaking thoroughness with which he has worked it out, but particularly for the liberality with which he has placed the result of his experiences at the disposal of photographers generally through the medium of the *Photographic News* Like most happy ideas, that of taking portraits by gaslight is strangely simple. The key to it lies in the employment of a burner of extraordinary capacity Mr Laws uses one of Wigham's, consisting of sixty-eight jets, capable of yielding an illuminating power of 1250 standard candles, and costing £5 The large flame produced by this is backed by a reflector, lined throughout with strips of silvered glass, a shape akin to that of a Dutch oven, only domed instead of being angular, is employed by Mr Laws, who also places a screen of violet glass between the flame and the sitter With extra sensitive gelatine plates, such as those prepared by Messrs Mawson and Swan, of Newcastle-on-Tyne, the exposure has been reduced to as low as eight seconds for cartes-de-visite It may be added that Messrs Mawson and Swan have undertaken the agency for the supply of apparatus similar to that employed by Mr Laws, and that from the latter gentleman specimen photographs can be obtained at a low cost, proving that the practical results of his process, as well as its theoretical advantages, are all that can be desired

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CHAPTER VIII

ENLARGING PROCESSES.

BEFORE detailing the various existing processes of enlargement, there is one little technical expression connected with this branch of photography which deserves explanation This is the expression "diameters," which is generally used to convey the degree of an enlargement with reference to the size of the original negative or print from which it was taken The following simple explanation, borrowed from a neat writer and good photographer, shows what is meant at a glance If the original negative or print measures 1in. by 1in and the enlargement 2in by 2in, the former is said to be enlarged two diameters, or, to use another expression, four times superficially, from the fact that while the original contains but 1in superficial the enlargement contains 4in To find the superficial enlargement, multiply the number of the diameters by itself

There are various methods of enlargement, some slightly complicated, and requiring large and expensive apparatus, others quite simple, and calling for but little additional apparatus to those usually employed in everyday work I hardly think my readers will quarrel with me if I give preference to the latter class At the same time I trust to be able to give at least an outline of the less simple processes, if only as illustrations of the principles on which their practice is based

Direct Printing with the Solar Camera—The first method of enlarging that I shall describe is that in which a "solar camera," such as that figured in the accompanying illustration, is employed to produce an enlarged image on ordinary paper or carbon tissue. The principle is as follows A large plano-convex lens, say, of 9in. diameter, condenses the rays of the sun (which are, of course, parallel), and in the cone of rays formed by this condenser is placed the negative to be enlarged The objective or enlarging lens is situated in or near the focus of these rays, and at a distance suitable to the size of enlargement required is fixed the frame to receive the sensitive paper or tissue In the apparatus shown in the illustration (kindly supplied by Mr J J Atkinson, of Manchester street, Liverpool, who manufactures these cameras, together with every other good variety of enlarging apparatus) these desiderata are all very neatly fulfilled The camera, moreover, is mounted on an axis which permits it to be pointed at the sun, and enables the operator to follow the earth's rotation with an accuracy sufficient for all practical purposes A more imposing form of this apparatus is one in which the camera with its condenser remains quite stationary, while the image of the sun is reflected on to the latter by a reflector, fitted with a clockwork

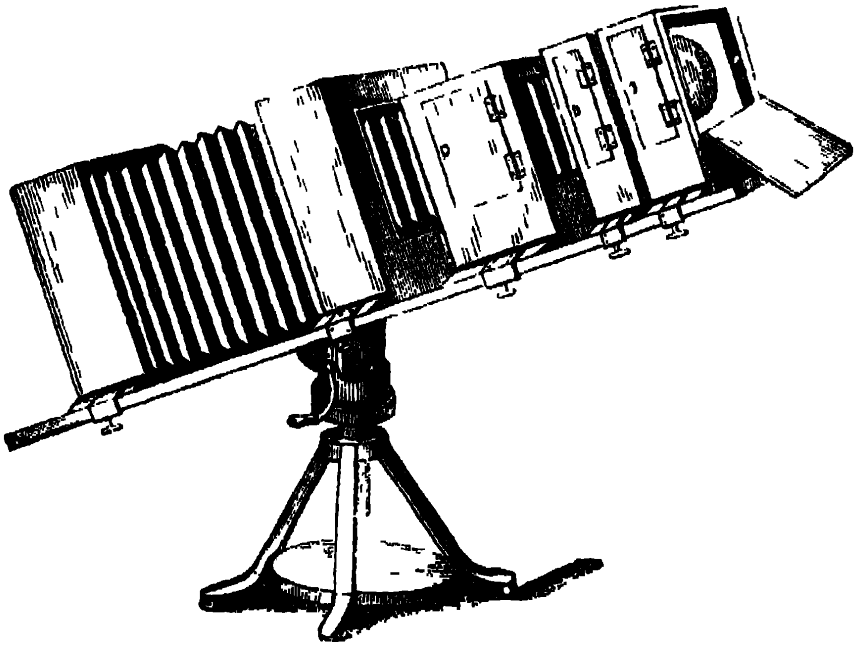

FIG. 8 ATKINSON'S SOLAR CAMERA

arrangement called a heliostat, which causes it to follow the sun automatically

It must be remarked that in these cameras the size of the condenser is an important element The larger its diameter, the greater the rapidity of exposure A diameter of 9in is about the least that can be employed with any success, but one of 14in is decidedly preferable

With the solar camera it will be found a great advantage to use carbon tissue in preference to silvered paper To understand this the reader should look back to the chapter on carbon printing, to the paragraph where the continuating action of light upon the exposed tissue is noticed As a matter of fact, a picture has been obtained by an exposure of two minutes, followed by a delay of two or three days between the exposure and developement of the print, which would have required six times as long an exposure if the developement had been proceeded with immediately

I have not entered at any great length into the above system of enlargement by direct printing with the solar camera for two reasons partly because the principles involved, both optical and mechanical, are, generally speaking, so simple that little explanation is required, partly because, in spite of this fact, the apparatus necessary is so expensive that, practically, it is quite beyond the reach of all except wealthy amateurs or very large firms where this class of work is made a speciality and carried on systematically to a very great extent indeed

One point, by the way, in favour of the solar camera is that, in bad weather, when direct printing on paper or tissue becomes impracticable, it may well be adapted to a method of enlarging from small negatives by developement, which I will now describe At the same time, it must not be thought that this latter system cannot be practised without a solar camera As will be shown, a much simpler and less costly apparatus can be devised to suit the purpose Still, it is as well to mention the fact that the solar camera is not restricted in its usefulness

By way of a small practical hint, it should be remembered that the frame to hold the negative should be made in such a manner as not to be affected by the great heat of the condensed rays, also that care be taken in removing the negative after an exposure, for reasons which the operator will best appreciate if he lays a negligent finger on the hot glass by way of experiment

Printing by Developement—There are two methods of printing by developement, which, while about equally suited to the operations of enlarging, are at once simple and popular The essential difference is that in one the support of the sensitive surface is paper, in the other, glass I will take the method of enlarging upon negative paper first To begin with, an apparatus—adapted, by the way, to either process—will have to be constructed in the following simple manner. A small room is selected and darkened, with the exception of a small open frame capable of receiving the negative or negatives to be enlarged With a very moderate ingenuity an arrangement may be made in such a manner that negatives of different sizes may be framed at will We now have a room which is practically a gigantic camera, and into which the light only passes through the negative to be enlarged. Outside the frame or window a *radiating* surface, such as a sheet of white cardboard or opal glass, is arranged in such a manner as to radiate the pure light from the upper sky through the negative If my readers will imagine the negative holder or frame to be a straight line, and will then draw another straight line from the lower end of the first, and making an angle of about 45 deg with it, they will easily understand my meaning Of course the second line represents the radiator, which may advantageously be hinged so as to fold up flush with the wall If cardboard be used as the radiator, it should be covered with glass to protect it from inclement weather Now let us turn to the inside of the room The first thing necessary is a table pushed up close to the wall in which is the negative holder On this the frame containing the lens will have to be worked The back of the lens, which may be an ordinary portrait combination (a quarter-plate lens being used for quarter-plate negatives, and so on), is pointed to the middle of the negative to be enlarged An arrangement must be made to allow the lens frame to be moved farther from or nearer to the negative, as required The construction of ordinary cameras will afford a guide Lastly, it is necessary to provide a third frame to hold the sensitive plate or paper during exposure A rough imitation of some form of a fire screen answers the purpose simply and satisfactorily The "apparatus" then comes to this there are three frames in a line, one, the negative frame, a stationary one, the other two movable Furthermore, there is an arrangement by which the light is radiated through two of the frames on to the third

The above being assumed to be in existence, we can now commence operations The negative to be enlarged is fixed in its frame, while on the frame shortly to hold the sensitive surface is pinned a piece of paper if negative paper is to be used, or a sheet of cardboard in the case of a sensitive glass plate To focus the enlargement, the lens frame and the frame supporting the surface are moved until the requisite degrees of sharpness and amplification (or reduction, by the way, for the apparatus fulfils either purpose) is secured There is a regular table for enlargement and reduction to be found at the end of the almanac published annually in connection with the *British Journal of Photography* All that is necessary is to know the number of times which it is desired to enlarge the original negative and the focal length of the lens On reference to the table it can be discovered at a glance what is the correct distance the sensitive plate must be from the centre of the lens, as well as the correct distance of the picture to be copied To borrow the stock example of the *British Journal of Photography*, let it be supposed that a photographer has a *carte* to enlarge to four times its size, and the lens he intends employing is one of 6in , equivalent focus He must, therefore, look for four on the upper horizontal line of the table, and for six in the first vertical column, and carry his eye to where the line and the column meet, which will be at a square space containing the figures, 30—7½ The greater of these indicates the distance the sensitive plate must be from the centre of the lens, the lesser, the distance of the picture to be copied To reduce a picture any given number of times, the same method must be followed, but in this case the greater number will represent the distance between the lens and the picture to be copied, the lesser that between the lens and the sensitive plate

As regards the preparation of negative paper this, we believe, is obtainable ready salted from Mr J Solomon, of 23, Red Lion-square, at the rate of about 13s per quire If, however, the operator prefers to salt his own, he should select a stout sample of paper and sponge it with, or float it over, the following compound

SALTING SOLUTION

Iodide of potassium	80grs
Bromide of ammonium	35grs
Chloride of ammonium	10grs
Gelatine	60grs
Albumen	1oz
Water	10oz

In the foregoing formula, which is that used by Mr J Solomon himself, the gelatine is, as usual, dissolved by heat To sensitise the above salted paper, a flat board is covered with blotting paper, the salted paper superposed on the latter and treated with the following solution, a pool of which is poured out into the middle of the surface, and spread over it by means of a tuft of wool

SENSITISING SOLUTION

Nitrate of silver	1oz
Glacial acetic acid	½oz
Water	12oz

To effect the exposure, the focussing paper is unpinned and replaced by the sensitised paper, still wet, the cap, in the meantime, having been put upon the lens When everything is ready, the cap is removed, and, after a few seconds' exposure, replaced Then follows developement of the enlarged image, which is accomplished by the aid of the following solution, best used while warm, and advantageously supplemented by a few drops of the sensitising solution to impart vigour

DEVELOPER

Gallic acid	60gr.
Acetate of lead	10gr
Water	10oz

I now turn to the method of producing enlargements upon a sensitised glass plate, known generally as collodion transfers, from the fact that, on developement and fixation of the image upon glass, it is transferred to a more convenient support in the shape of paper

It may be premised that while, as before mentioned, the same apparatus may be used as in dealing with negatives, the successive operations, with some slight exceptions, are essentially identical The first difference occurs, in fact, in the actual preparation of the plate This is coated with a tough, horny, and extra bromised collodion It is then sensitised in a negative bath, the receptacle being, in cases of enlargements of good size, preferably one of the "wave" pattern, as catalogued and sold by almost every photographic dealer The image may be either developed with iron and subsequently blackened by a toning solution of chloride of gold, mercury, or platinum, or, to save the latter supplementary operation, developed simply with the following

DEVELOPER

Pyrogallic acid	100grs
Citric acid	60grs
Acetic acid	2oz
Water	20oz

Fixation with hyposulphite of soda follows

If a toning solution is used, its action should be ascertained by reference to the back of the plate and by inspecting the image by transmitted light

The transfer paper is prepared by floating a suitable sample upon a warm solution of

Gelatine	1oz
Water	10oz
Chrome alum	4oz

The last ingredient is added separately, being previously dissolved in a little warm water The gelatine solution will not keep, but the paper floated on it will do so well

To transfer the picture, which is supposed to be still wet after the washing out of the fixing salt, a piece of the dry transfer paper is soaked for about ten minutes in cold water until it is slimy to the touch It is now laid gelatine face downwards on to the collodion film and lightly pressed into contact therewith When dry it may be easily stripped from the glass, when the enlarged image will be found supported on the paper, and possessing a highly glossy surface This can be finished in oils without further preparation If a matt surface be desired the paper is stripped off the glass before it is quite dry, or if it has been allowed to dry, the same result may be obtained by leaving both glass and paper in water a short time before stripping.

For much assistance in placing the above methods fully and clearly before my readers I am indebted to an exhaustive article in the *British*

Journal of Photography Almanac for 1878, on the "Modern Practice of Enlarging," by Mr J Traill Taylor

Enlargement by Artificial Light —This method may be described as being extremely simple and convenient, while giving results which, if adequate care is taken, should rival those procurable by any other process of enlarging It may be practised in two different ways with two different ends in view First, when an extremely powerful light is used and it is desired to produce but one copy of the enlargement, secondly, when a less powerful and more easily accessible and manageable light is adopted with the object of producing an enlarged negative, from which, of course, any number of copies can be made at will

The best type of apparatus applicable to the first case is Solomon's Magnesium Light Enlarging Apparatus, which is certainly a most admirably contrived and efficacious machine It consists of a lantern resembling the ordinary optical or magic lanterns in vogue, and fitted with one of Solomon's clockwork magnesium lamps already alluded to in connection with photography by artificial light A chimney is also added to carry away the fumes of the combusted ribbon All that is necessary in using the apparatus is to place the lantern on a table or other suitable support, having at hand, meanwhile, a stand or frame to hold the plate or paper on which the enlargement can be projected Either of the two processes of negative paper or collodion transfer as just described under the heading of printing by developement may be used Now wind up the clockwork of the lamp, open the door of the lantern, set the clockwork in motion, and when the ribbon is about 1in. beyond the conductor stop the motion Place the negative in the orifice in front of the condenser and pin the focussing screen of paper or card upon the stand or frame, Light the lamp, close the door, and focus the picture Then stop the clockwork, place the cap on the lens, remove the focussing screen, and replace it by the sensitised glass or paper Relight the lamp, remove the cap from the lens, and expose according to the density of the negative From thirty to forty seconds will probably be about correct Developement proceeds as explained in the preceding section At the bottom of the lantern chimney is a removable tin cup, which should be kept nearly full of water. Into it fall the ashes of the burnt ribbon

The cost of an exposure at the present price of magnesium (about 12s. per oz.) is about 2d.

An apparatus (without lens, which can be of the ordinary portrait combination pattern) having 3½in. condenser, No 1 magnesium lamp, with roller, smoke tubes, elbows, semicircles, &c., is £5 10s. This is suitable for enlarging vignettes and most portrait negatives With 4½in condensers the apparatus cost £7 15s, with 6in, £10 10s.

In the second general method of producing enlargements by artificial light, the ordinary Sciopticon lantern is used This is fitted with a double or triple wicked paraffin lamp It is placed on a table or stand like the magnesium light apparatus, the frame to support the plate being also required as before Into the orifice in front of the condenser is slid a transparency from the negative to be enlarged After focussing, the cap is replaced on the lens, and a dry or wet plate, preferably the former, is substituted for the focussing screen Exposure, varying according to the density of the transparency and the kind of sensitive plate employed, follows, then developement and fixation in due course

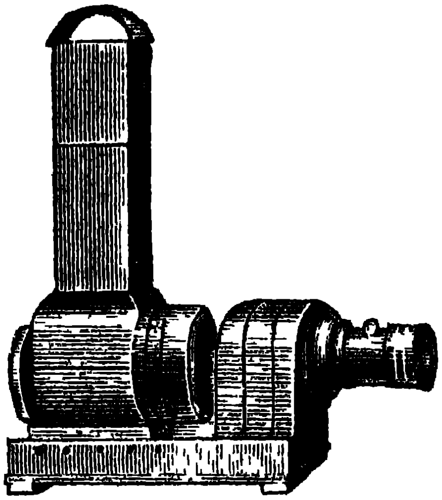

FIG 9 SCIOPTICON LANTERN

By turning the transparency round, a reverse enlarged negative can be obtained

An advantage of the above method is that there are three distinct opportunities for contributing improvement to the ultimate result The original negative may be retouched, then the transparency, and lastly the enlarged negative

The transparency may be produced by any of the methods described in the chapter devoted to that subject. Perhaps the carbon process, the special tissue being adopted, is to be recommended in preference to the others

Enlarging Apparatus —There are various kinds of complete enlarging apparatus in the market, by which enlargements may be secured with the least possible trouble and of great excellence. Amongst these may be mentioned Edwards' Enlarging and Copying Apparatus, which has been made the subject of a patent The price of one to enlarge from ¼ to ½ plate is £10 An extremely neat and efficient little machine, costing only 30s., is Hunter and Sand's (Cranbourne-street, Leicester-square) Copying and Enlarging Cone, which can be easily fitted to the front of almost any camera For neatness, efficiency, portability, and cheapness it deserves every recommendation

CHAPTER IX

PHOTO-MICROGRAPHY

BEFORE concluding this series, let me say just a very few words on the subject of photo-micrography, or the art of photographing the enlarged images obtained by the microscope I shall not stop long over this, for the thing is so simple and so easily managed in every way At the same time, I wish all my readers to understand that I do not any the less on this account encourage them to practise this most interesting branch of photography Indeed, I can recommend to them few better occupations for their evenings than to unite in this one study the benefits to be gained by the use of the microscope combined with the scientific wonders involved in that of the sensitive plate

All the apparatus required consists of a simple camera and a microscope, preferably one which will allow the tube to be turned back so as to be horizontal Otherwise some sort of framework must be made so as to facilitate the union of the microscope with the camera, which is managed by simply withdrawing the eye-piece of the former and introducing the tube into the camera front A temporary front may easily be screwed on to the camera so as to permit the junction of the microscope to it to be effected without any entrance of actinic light.

A low powered object glass is adapted, and an ordinary paraffin lamp arranged so as to duly light the object which may now be placed on the stage The reflector being adjusted, the image of the object may be carefully focussed on the screen, dimensions being regulated by increasing distance between lens and focussing screen, and decreasing distance between lens and object

The focussing being accomplished, the screen is replaced by the dark slide containing a dry plate, which is exposed by drawing up the shutter, developed, &c , in the ordinary manner, and that is all

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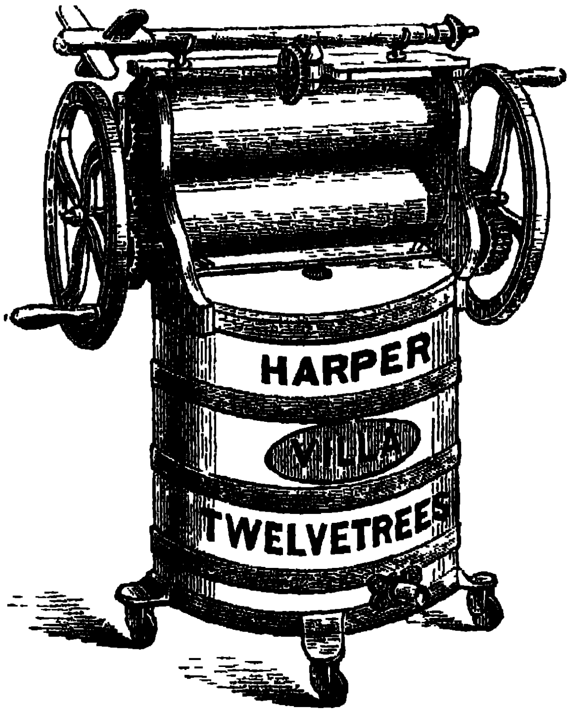

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